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October 2009

## INFORMATION TECHNOLOGY

Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions



Highlights of [GAO-10-2](#), a report to the Chairman, Subcommittee on Federal Financial Management, Government Information, Federal Services, and International Security, Committee on Homeland Security and Governmental Affairs, U.S. Senate

## Why GAO Did This Study

In fiscal year 2009, the federal government planned to spend about \$71 billion on information technology (IT) investments. To more effectively manage such investments, in 2005 the Office of Management and Budget (OMB) directed agencies to implement earned value management (EVM). EVM is a project management approach that, if implemented appropriately, provides objective reports of project status, produces early warning signs of impending schedule delays and cost overruns, and provides unbiased estimates of anticipated costs at completion.

GAO was asked to assess selected agencies' EVM policies, determine whether they are adequately using earned value techniques to manage key system acquisitions, and evaluate selected investments' earned value data to determine their cost and schedule performances. To do so, GAO compared agency policies with best practices, performed case studies, and reviewed documentation from eight agencies and 16 major investments with the highest levels of IT development-related spending in fiscal year 2009.

## What GAO Recommends

GAO is recommending that the selected agencies modify EVM policies to be consistent with best practices, implement EVM practices that address identified weaknesses, and manage negative earned value trends. Seven agencies that commented on a draft of this report generally agreed with GAO's results and recommendations.

[View GAO-10-2 or key components.](#)  
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## Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions

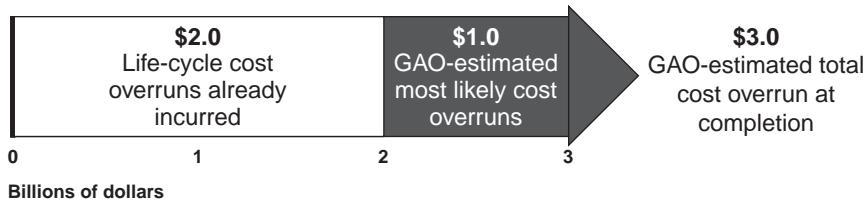
### What GAO Found

While all eight agencies have established policies requiring the use of EVM on major IT investments, these policies are not fully consistent with best practices. In particular, most lack training requirements for all relevant personnel responsible for investment oversight. Most policies also do not have adequately defined criteria for revising program cost and schedule baselines. Until agencies expand and enforce their EVM policies, it will be difficult for them to gain the full benefits of EVM.

GAO's analysis of 16 investments shows that agencies are using EVM to manage their system acquisitions; however, the extent of implementation varies. Specifically, for 13 of the 16 investments, key practices necessary for sound EVM execution had not been implemented. For example, the project schedules for these investments contained issues—such as the improper sequencing of key activities—that undermine the quality of their performance baselines. This inconsistent application of EVM exists in part because of the weaknesses contained in agencies' policies, combined with a lack of enforcement of policies already in place. Until key EVM practices are fully implemented, these investments face an increased risk that managers cannot effectively optimize EVM as a management tool.

Furthermore, earned value data trends of these investments indicate that most are currently experiencing shortfalls against cost and schedule targets. The total life-cycle costs of these programs have increased by about \$2 billion. Based on GAO's analysis of current performance trends, 11 programs will likely incur cost overruns that will total about \$1 billion at contract completion—in particular, 2 of these programs account for about 80 percent of this projection. As such, GAO estimates the total cost overrun to be about \$3 billion at program completion (see figure). However, with timely and effective management action, it is possible to reverse negative trends so that the projected cost overruns may be reduced.

### Cost Overruns Incurred and Projected Overruns of 16 Programs



Source: GAO analysis of program data.

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## Abbreviations

ACE	Automated Commercial Environment
ANSI	American National Standards Institute
AOC	Air and Space Operations Center—Weapon System
COP	Integrated Deepwater System—Common Operational Picture
DOD	Department of Defense
DRIS	Decennial Response Integration System
EIA	Electronic Industries Alliance
ERAM	En Route Automation Modernization
EV	earned value
EVM	earned value management
FDCA	Field Data Collection Automation
IT	information technology
JTRS-HMS	Joint Tactical Radio System—Handheld, Manpack, Small Form Fit
JWST	James Webb Space Telescope
MIDAS	Farm Program Modernization
MSL	Mars Science Laboratory
NASA	National Aeronautics and Space Administration
NGI	Next Generation Identification
OMB	Office of Management and Budget
SBS	Surveillance and Broadcast System
VistA-FM	Veterans Health Information Systems and Technology Architecture—Foundations Modernization
WHTI	Western Hemisphere Travel Initiative
WIN-T	Warfighter Information Network—Tactical

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**United States Government Accountability Office  
Washington, DC 20548**

October 8, 2009

The Honorable Thomas R. Carper  
Chairman  
Subcommittee on Federal Financial Management,  
Government Information, Federal Services,  
and International Security  
Committee on Homeland Security and  
Governmental Affairs  
United States Senate

Dear Mr. Chairman:

In fiscal year 2009, the federal government planned to spend over \$70 billion on information technology (IT) investments, many of which involve systems and technologies to modernize legacy systems, increase communication and networking capabilities, and transition to new systems designed to significantly improve the government's ability to carry out critical mission functions into the 21st century. To more effectively manage such investments, the Office of Management and Budget (OMB) has a number of key initiatives under way—one of which was established in 2005 and directs agencies to implement earned value management (EVM).<sup>1</sup> EVM is a project management approach that, if implemented appropriately, provides objective reports of project status, produces early warning signs of impending schedule slippages and cost overruns, and provides unbiased estimates of anticipated costs at completion.

This report responds to your request that we review the federal government's use of EVM. Specifically, our objectives were to (1) assess whether key departments and agencies have appropriately established EVM policies, (2) determine whether these agencies are adequately using earned value techniques to manage key system acquisitions, and (3) evaluate the earned value data of these selected investments to determine their cost and schedule performances.

To address our objectives, we reviewed agency EVM policies and individual programs' EVM-related documentation, including cost performance reports and project schedules, from eight agencies and 16

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<sup>1</sup>OMB Memorandum, M-05-23 (Aug. 4, 2005).

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major investments from those agencies, respectively.<sup>2</sup> The eight agencies account for about 75 percent of the planned IT spending for fiscal year 2009. The 16 programs selected for case study represent investments with about \$3.5 billion in total planned spending for system development work in fiscal year 2009. We compared the agencies' policies and practices with federal standards and best practices of leading organizations to determine the effectiveness of their use of earned value data in managing IT investments. We also analyzed the earned value data from the programs to determine whether they are projected to finish within planned cost and schedule targets. In addition, we interviewed relevant agency officials, including key personnel on programs that we selected for case study and officials responsible for implementing EVM.

We conducted this performance audit from February to October 2009, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Appendix I contains further details about our objectives, scope, and methodology. See also the page of related products at the end of this report for previous work that we have done on certain programs in our case studies.

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## Background

Each year, OMB and federal agencies work together to determine how much the government plans to spend on IT projects and how these funds are to be allocated. Planned federal IT spending in fiscal year 2009 totaled about \$71 billion—of which \$22 billion was planned for IT system development work, and the remainder was planned for operations and maintenance of existing systems. OMB plays a key role in overseeing federal agencies' IT investments and how they are managed, stemming from its functions of assisting the President in overseeing the preparation of the federal budget and supervising budget preparation in executive branch agencies. In helping to formulate the President's spending plans, OMB is responsible for evaluating the effectiveness of agency programs, policies, and procedures; assessing competing funding demands among

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<sup>2</sup>The eight agencies were the Departments of Agriculture, Commerce, Defense, Homeland Security, Justice, Transportation, and Veterans Affairs, and the National Aeronautics and Space Administration.

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agencies; and setting funding priorities. To carry out these responsibilities, OMB depends on agencies to collect and report accurate and complete information; these activities depend, in turn, on agencies having effective IT management practices.

To drive improvement in the implementation and management of IT projects, Congress enacted the Clinger-Cohen Act in 1996, expanding the responsibilities delegated to OMB and agencies under the Paperwork Reduction Act.<sup>3</sup> The Clinger-Cohen Act requires agencies to engage in performance- and results-based management, and to implement and enforce IT management policies and guidelines. The act also requires OMB to establish processes to analyze, track, and evaluate the risks and results of major capital investments in information systems made by executive agencies.

Over the past several years, we have reported and testified on OMB's initiatives to highlight troubled projects,<sup>4</sup> justify IT investments,<sup>5</sup> and use project management tools.<sup>6</sup> We have made multiple recommendations to OMB and federal agencies to improve these initiatives to further enhance the oversight and transparency of federal IT projects. As a result, OMB recently used this body of work to develop and implement improved processes to oversee and increase transparency of IT investments. Specifically, in June 2009, OMB publicly deployed a Web site that displays dashboards of all major federal IT investments to provide OMB and others with the ability to track the progress of these investments over time.

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<sup>3</sup>44 U.S.C. § 3504(h), 3506(h).

<sup>4</sup>GAO, *Information Technology: Management and Oversight of Projects Totaling Billions of Dollars Need Attention*, GAO-09-624T (Washington, D.C.: Apr. 28, 2009); *Information Technology: Treasury Needs to Better Define and Implement Its Earned Value Management Policy*, GAO-08-951 (Washington, D.C.: Sept. 22, 2008); *Information Technology: Further Improvements Needed to Identify and Oversee Poorly Planned and Performing Projects*, GAO-07-1211T (Washington, D.C.: Sept. 20, 2007); *Information Technology: Improvements Needed to More Accurately Identify and Better Oversee Risky Projects Totaling Billions of Dollars*, GAO-06-1099T (Washington, D.C.: Sept. 7, 2006); and *Information Technology: Agencies and OMB Should Strengthen Processes for Identifying and Overseeing High Risk Projects*, GAO-06-647 (Washington, D.C.: June 15, 2006).

<sup>5</sup>GAO, *Information Technology: OMB Can Make More Effective Use of Its Investment Reviews*, GAO-05-276 (Washington, D.C.: Apr. 15, 2005).

<sup>6</sup>GAO-08-951 and GAO, *Air Traffic Control: FAA Uses Earned Value Techniques to Help Manage Information Technology Acquisitions, but Needs to Clarify Policy and Strengthen Oversight*, GAO-08-756 (Washington, D.C.: July 18, 2008).

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## EVM Provides Insight on Program Cost and Schedule

Given the size and significance of the government's investment in IT, it is important that projects be managed effectively to ensure that public resources are wisely invested. Effectively managing projects entails, among other things, pulling together essential cost, schedule, and technical information in a meaningful, coherent fashion so that managers have an accurate view of the program's development status. Without meaningful and coherent cost and schedule information, program managers can have a distorted view of a program's status and risks. To address this issue, in the 1960s, the Department of Defense (DOD) developed the EVM technique, which goes beyond simply comparing budgeted costs with actual costs. This technique measures the value of work accomplished in a given period and compares it with the planned value of work scheduled for that period and with the actual cost of work accomplished.

Differences in these values are measured in both cost and schedule variances. Cost variances compare the value of the completed work (i.e., the earned value) with the actual cost of the work performed. For example, if a contractor completed \$5 million worth of work and the work actually cost \$6.7 million, there would be a negative \$1.7 million cost variance. Schedule variances are also measured in dollars, but they compare the earned value of the completed work with the value of the work that was expected to be completed. For example, if a contractor completed \$5 million worth of work at the end of the month but was budgeted to complete \$10 million worth of work, there would be a negative \$5 million schedule variance. Positive variances indicate that activities are costing less or are completed ahead of schedule. Negative variances indicate activities are costing more or are falling behind schedule. These cost and schedule variances can then be used in estimating the cost and time needed to complete the program.

Without knowing the planned cost of completed work and work in progress (i.e., the earned value), it is difficult to determine a program's true status. Earned value allows for this key information, which provides an objective view of program status and is necessary for understanding the health of a program. As a result, EVM can alert program managers to potential problems sooner than using expenditures alone, thereby reducing the chance and magnitude of cost overruns and schedule slippages. Moreover, EVM directly supports the institutionalization of key processes for acquiring and developing systems and the ability to effectively manage investments—areas that are often found to be inadequate on the basis of our assessments of major IT investments.

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## Federal Guidance Calls for Using EVM to Improve IT Management

In August 2005, OMB issued guidance outlining steps that agencies must take for all major and high-risk development projects to better ensure improved execution and performance and to promote more effective oversight through the implementation of EVM.<sup>7</sup> Specifically, this guidance directs agencies to (1) develop comprehensive policies to ensure that their major IT investments are using EVM to plan and manage development; (2) include a provision and clause in major acquisition contracts or agency in-house project charters directing the use of an EVM system that is compliant with the American National Standards Institute (ANSI) standard;<sup>8</sup> (3) provide documentation demonstrating that the contractor's or agency's in-house EVM system complies with the national standard; (4) conduct periodic surveillance reviews; and (5) conduct integrated baseline reviews<sup>9</sup> on individual programs to finalize their cost, schedule, and performance goals.

Building on OMB's requirements, in March 2009, we issued a guide on best practices for estimating and managing program costs.<sup>10</sup> This guide highlights the policies and practices adopted by leading organizations to implement an effective EVM program. Specifically, in the guide, we identify the need for organizational policies that establish clear criteria for which programs are required to use EVM, specify compliance with the ANSI standard, require a standard product-oriented structure for defining work products, require integrated baseline reviews, provide for specialized training, establish criteria and conditions for rebaselining programs, and require an ongoing surveillance function. In addition, we identify key practices that individual programs can use to ensure that they establish a sound EVM system, that the earned value data are reliable, and that the data are used to support decision making.

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<sup>7</sup>OMB Memorandum, M-05-23 (Aug. 4, 2005).

<sup>8</sup>Recognizing the importance of ensuring quality earned value data, ANSI and the Electronic Industries Alliance (EIA) jointly established a national standard for EVM systems in May 1998 (ANSI/EIA-748-A-1998). This standard, commonly called the ANSI standard, is comprised of guidelines to instruct programs on how to establish a sound EVM system. This document was updated in July 2007 and is referred to as ANSI/EIA-748-B.

<sup>9</sup>An integrated baseline review is an evaluation of a program's baseline plan to determine whether all program requirements have been addressed, risks have been identified, mitigation plans are in place, and available and planned resources are sufficient to complete the work.

<sup>10</sup>GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP (Washington, D.C.: March 2009).

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## Prior Reviews on Agency Use of EVM to Acquire and Manage IT Systems Have Identified Weaknesses

We have previously reported on the weaknesses associated with the implementation of sound EVM programs at various agencies, as well as on the lack of aggressive management action to correct poor cost and schedule performance trends based on earned value data for major system acquisition programs:

- In July 2008, we reported that the Federal Aviation Administration's EVM policy was not fully consistent with best practices.<sup>11</sup> For example, the agency required its program managers to obtain EVM training, but did not enforce completion of this training or require other relevant personnel to obtain this training. In addition, although the agency was using EVM to manage IT acquisitions, not all programs were ensuring that their earned value data were reliable. Specifically, of the three programs collecting EVM data, only one program adequately ensured that its earned value data were reliable. As a result, the agency faced an increased risk that managers were not getting the information they needed to effectively manage the programs. In response to our findings and recommendations, the Federal Aviation Administration reported that it had initiatives under way to improve its EVM oversight processes.
- In September 2008, we reported that the Department of the Treasury's EVM policy was not fully consistent with best practices.<sup>12</sup> For example, while the department's policy addressed some practices, such as establishing clear criteria for which programs are to use EVM, it did not address others, such as requiring and enforcing EVM training. In addition, six programs at Treasury and its bureaus were not consistently implementing practices needed for establishing a comprehensive EVM system. For example, when executing work plans and recording actual costs, a key practice for ensuring that the data resulting from the EVM system are reliable, only two of the six investments that we reviewed incorporated government costs with contractor costs. As a result, we reported that Treasury may not be able to effectively manage its critical programs. In response to our findings and recommendations, Treasury reported that it would release a revised EVM policy and further noted that initiatives to improve EVM-related training were under way.
- In a series of reports and testimonies from September 2004 to June 2009, we reported that the National Oceanic and Atmospheric Administration's National Polar-orbiting Operational Environmental Satellite System program

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<sup>11</sup>[GAO-08-756](#).

<sup>12</sup>[GAO-08-951](#).

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was likely to overrun its contract at completion on the basis of our analysis of contractor EVM data.<sup>13</sup> Specifically, the program had delayed key milestones and experienced technical issues in the development of key sensors, which we stated would affect cost and schedule estimates. As predicted, in June 2006 the program was restructured, decreasing its complexity, delaying the availability of the first satellite by 3 to 5 years, and increasing its cost estimate from \$6.9 billion to \$12.5 billion. However, the program has continued to face significant technical and management issues. As of June 2009, launch of the first satellite was delayed by 14 months, and our current projected total cost estimate is approximately \$15 billion. We made multiple recommendations to improve this program, including establishing a realistic time frame for revising the cost and schedule baselines, developing plans to mitigate the risk of gaps in satellite continuity, and tracking the program executive committee's action items from inception to closure.

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## Agencies' EVM Policies Are Not Comprehensive

While the eight agencies we reviewed have established policies requiring the use of EVM on their major IT investments, none of these policies are fully consistent with best practices, such as standardizing the way work products are defined. We recently reported<sup>14</sup> that leading organizations establish EVM policies that

- establish clear criteria for which programs are to use EVM;
- require programs to comply with the ANSI standard;
- require programs to use a product-oriented structure for defining work products;
- require programs to conduct detailed reviews of expected costs, schedules, and deliverables (called an integrated baseline review);

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<sup>13</sup>GAO, *Polar-Orbiting Environmental Satellites: With Costs Increasing and Data Continuity at Risk, Improvements Needed in Tri-agency Decision Making*, GAO-09-564 (Washington, D.C.: June 17, 2009); *Polar-Orbiting Operational Environmental Satellites: Restructuring Is Under Way, but Technical Challenges and Risks Remain*, GAO-07-498 (Washington, D.C.: Apr. 27, 2007); *Polar-Orbiting Operational Environmental Satellites: Cost Increases Trigger Review and Place Program's Direction on Hold*, GAO-06-573T (Washington, D.C.: Mar. 30, 2006); *Polar-Orbiting Operational Environmental Satellites: Technical Problems, Cost Increases, and Schedule Delays Trigger Need for Difficult Trade-off Decisions*, GAO-06-249T (Washington, D.C.: Nov. 16, 2005); and *Polar-Orbiting Environmental Satellites: Information on Program Cost and Schedule Changes*, GAO-04-1054 (Washington, D.C.: Sept. 30, 2004).

<sup>14</sup>GAO-09-3SP.

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- require and enforce EVM training;
- define when programs may revise cost and schedule baselines (called rebaselining); and
- require system surveillance—that is, routine validation checks to ensure that major acquisitions are continuing to comply with agency policies and standards.

Table 1 describes the key components of an effective EVM policy.

**Table 1: Key Components of an Effective EVM Policy**

Component	Description
Clear criteria for implementing EVM on all major IT investments	OMB requires agencies to implement EVM on all major IT investments and ensure that the corresponding contracts include provisions for using EVM systems. However, each agency is responsible for establishing its own definition of a “major” IT investment. As a result, agencies should clearly define the conditions under which a new or ongoing acquisition program is required to implement EVM.
Compliance with the ANSI standard	OMB requires agencies to use EVM systems that are compliant with a national standard developed by ANSI and EIA (ANSI/EIA-748-B). This standard consists of 32 guidelines that an organization can use to establish a sound EVM system, ensure that the data resulting from the EVM system are reliable, and use earned value data for decision-making purposes.
Standard structure for defining the work products	The work breakdown structure defines the work necessary to accomplish a program’s objectives. It is the first criterion stated in the ANSI standard and the basis for planning the program baseline and assigning responsibility for the work. It is a best practice to establish a product-oriented work breakdown structure because it allows a program to track cost and schedule by defined deliverables, such as a hardware or software component. This allows a program manager to more precisely identify which components are causing cost or schedule overruns and to more effectively mitigate the root cause of the overruns. Standardizing the work breakdown structure is also considered a best practice because it enables an organization to collect and share data among programs.
Integrated baseline review	An integrated baseline review is an evaluation of the performance measurement baseline—the foundation for an EVM system—to determine whether all program requirements have been addressed, risks have been identified, mitigation plans are in place, and available and planned resources are sufficient to complete the work. The main goal of an integrated baseline review is to identify potential program risks, including risks associated with costs, management processes, resources, schedules, and technical issues.
Training requirements	EVM training should be provided and enforced for all personnel with investment oversight and program management responsibilities. Executive personnel with oversight responsibilities need to understand EVM terms and analysis products to make sound investment decisions. Program managers and staff need to be able to interpret and validate earned value data to effectively manage deliverables, costs, and schedules.

Component	Description
Rebaselining criteria	At times, management may conclude that the remaining budget and schedule targets for completing a program (including the contract) are significantly insufficient, and that the current baseline is no longer valid for realistic performance measurement. Management may decide that a revised baseline for the program is needed to restore its control of the remaining work effort. An agency's rebaselining criteria should define acceptable reasons for rebaselining and require programs to (1) explain why the current plan is no longer feasible and what measures will be implemented to prevent recurrence and (2) develop a realistic cost and schedule estimate for remaining work that has been validated and spread over time to the new plan.
System surveillance	Surveillance is the process of reviewing a program's (including contractors') EVM system as it is applied to one or more programs. The purpose of surveillance is to focus on how well a program is using its EVM system to manage cost, schedule, and technical performances. The following two goals are associated with EVM system surveillance: (1) ensure that the program is following corporate processes and procedures and (2) confirm that the program's processes and procedures continue to satisfy ANSI guidelines.

Source: GAO-09-3SP.

The eight agencies we reviewed do not have comprehensive EVM policies. Specifically, none of the agencies' policies are fully consistent with all seven key components of an effective EVM policy. Table 2 provides a detailed assessment, by agency, and a discussion of the agencies' policies follows the table.

**Table 2: Assessment of Key Agencies' EVM Policies**

Agency	Clear criteria for implementing EVM on all major IT investments	Compliance with the ANSI standard	Standard structure for defining the work products	Integrated baseline review	Training requirements	Rebaselining criteria	System surveillance
Agriculture	●	●	○	●	○	○	●
Commerce	●	●	○	●	●	●	●
Defense	●	●	●	●	○	●	●
Homeland Security	●	●	○	●	○	○	●
Justice	●	●	○	●	○	●	●
National Aeronautics and Space Administration	●	●	○	●	○	○	●
Transportation	●	○	○	●	○	○	●
Veterans Affairs	○	●	○	●	○	○	●

**Key**

●=The agency addressed all EVM practices in this policy area.

○=The agency addressed some EVM practices in this policy area.

○=The agency did not address any EVM practices in this policy area.

Source: GAO analysis of agency data.

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- *Criteria for implementing EVM on all IT major investments:* Seven of the eight agencies fully defined criteria for implementing EVM on major IT investments. The agencies with sound policies typically defined “major” investments as those exceeding a certain cost threshold, and, in some cases, agencies defined lower tiers of investments requiring reduced levels of EVM compliance. Veterans Affairs only partially met this key practice because its policy did not clearly state whether programs or major subcomponents of programs (projects and subprojects) had to comply with EVM requirements. According to agency officials, this lack of clarity may cause EVM to be inconsistently applied across the investments. Without an established policy that clearly defines the conditions under which new or ongoing acquisition programs are required to implement EVM, these agencies cannot ensure that EVM is being appropriately applied on their major investments.
- *Compliance with the ANSI standard:* Seven of the eight agencies required that all work activities performed on major investments be managed by an EVM system that complies with industry standards. One agency, Transportation, partially met this key practice because its policy contained inconsistent criteria for when investments must comply with standards. Specifically, in one section, the policy requires a certain class of investments to adhere to a subset of the ANSI standard; however, in another section, the policy merely states that the investments must comply with general EVM principles. This latter section is vague and could be interpreted in multiple ways, either more broadly or narrowly than the specified subset of the ANSI standard. Without consistent criteria on investment compliance, Transportation may be unable to ensure that the work activities for some of its major investments are establishing sound EVM systems that produce reliable earned value data and provide the basis for informed decision making.
- *Standard structure for defining the work products:* DOD was the only agency to fully meet this key practice by developing and requiring the use of standard product-oriented work breakdown structures. Four agencies did not meet this key practice, while the other three only partially complied. Of those agencies that partially complied, National Aeronautics and Space Administration (NASA) policy requires mission (or space flight) projects to use a standardized product-oriented work breakdown structure; however, IT projects do not have such a requirement. NASA officials reported that they are working to develop a standard structure for their IT projects; however, they were unable to provide a time frame for completion. Homeland Security and Justice have yet to standardize their product structures.

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Among the agencies that did not implement this key practice, reasons included, among other things, the difficulty in establishing a standard structure for component agencies that conduct different types of work with varying complexity. While this presents a challenge, agencies could adopt an approach similar to DOD's and develop various standard work structures based on the kinds of work being performed by the various component agencies (e.g., automated information system, IT infrastructure, and IT services). Without fully implementing a standard product-oriented structure (or structures), agencies will be unable to collect and share data among programs and may not have the information they need to make decisions on specific program components.

- *Integrated baseline review:* All eight agencies required major IT investments to conduct an integrated baseline review to ensure that program baselines fully reflect the scope of work to be performed, key risks, and available resources. For example, DOD required that these reviews occur within 6 months of contract award and after major modifications have taken place, among other things.
- *Training requirements:* Commerce was the only agency to fully meet this key practice by requiring and enforcing EVM training for all personnel with investment oversight and program management responsibilities. Several of the partially compliant agencies required EVM training for project managers—but did not extend this requirement to other program management personnel or executives with investment oversight responsibilities. Many agencies told us that it would be a significant challenge to require and enforce EVM training for all relevant personnel, especially at the executive level. Instead, most agencies have made voluntary EVM training courses available agencywide. However, without comprehensive EVM training requirements and enforcement, agencies cannot effectively ensure that programs have the appropriate skills to validate and interpret EVM data, and that their executives will be able to make fully informed decisions based on the EVM analysis.
- *Rebaselining criteria:* Three of the eight agencies fully met this key practice. For example, the Justice policy outlines acceptable reasons for rebaselining, such as when the baseline no longer reflects the current scope of work being performed, and requires investments to explain why their current plans are no longer feasible and to develop realistic cost and schedule estimates for remaining work. Among the five partially compliant agencies, Agriculture and Veterans Affairs provided policies, but in draft form; NASA was in the process of updating its policy to include more detailed criteria for rebaselining; and Homeland Security did not define acceptable reasons but did require an explanation of the root causes for

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cost and schedule variances and the development of new cost and schedule estimates. In several cases, agencies were unaware of the detailed rebaselining criteria to be included in their EVM policies. Until their policies fully meet this key practice, agencies face an increased risk that their executive managers will make decisions about programs with incomplete information, and that these programs will continue to overrun costs and schedules because their underlying problems have not been identified or addressed.

- *System surveillance:* All eight agencies required ongoing EVM system surveillance of all programs (and contracts with EVM requirements) to ensure their continued compliance with industry standards. For example, Agriculture required its surveillance teams to submit reports—to the programs and the Chief Information Officer—with documented findings and recommendations regarding compliance. Furthermore, the agency also established a schedule to show when EVM surveillance is expected to take place on each of its programs.

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## Agencies' Key Acquisition Programs Are Using EVM, but Are Not Consistently Implementing Key Practices

Our studies of 16 major system acquisition programs showed that all agencies are using EVM; however, the extent of that implementation varies among the programs. Our work on best practices in EVM identified 11 key practices that are implemented on acquisition programs of leading organizations. These practices can be organized into three management areas: establishing a sound EVM system, ensuring reliable data, and using earned value data to make decisions. Table 3 lists these 11 key EVM practices by management area.

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**Table 3: Eleven Key EVM Practices for System Acquisition Programs**

<b>Program management area of responsibility</b>	<b>EVM practice</b>
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure Identify who in the organization will perform the work Schedule the work Estimate the labor and material required to perform the work and authorize the budgets, including management reserve Determine objective measure of earned value Develop the performance measurement baseline
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs Analyze EVM performance data and record variances from the performance measurement baseline plan

Program management area of responsibility	EVM practice
	Forecast estimates at completion
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks
	Update the performance measurement baseline as changes occur

Source: GAO-09-3SP.

Of the 16 case study programs, 3 demonstrated a full level of maturity in all three management areas; 3 had full maturity in two areas; and 4 had reached full maturity in one area. The remaining 6 programs did not demonstrate full levels of maturity in any of the management areas; however, in all but 1 case, they were able to demonstrate partial capabilities in each of the three areas. Table 4 identifies the 16 case study programs and summarizes our results for these programs. Following the table is a summary of the programs' implementation of each key area of EVM program management responsibility. Additional details on the 16 case studies are provided in appendix II.

**Table 4: Assessment of EVM Practices for Case Study Programs**

Agency	Program	Establishing a comprehensive EVM system	Ensuring that data resulting from the EVM system are reliable	Ensuring that the program management team is using earned value data for decision-making purposes
Agriculture	Farm Program Modernization	○	●	●
Commerce	Decennial Response Integration System	●	●	●
	Field Data Collection Automation	○	○	○
Defense	Air and Space Operations Center—Weapon System	○	○	●
	Joint Tactical Radio System—Handheld, Manpack, Small Form Fit	○	●	●
	Warfighter Information Network—Tactical	○	●	○
Homeland Security	Automated Commercial Environment	○	○	●
	Integrated Deepwater System—Common Operational Picture	○	○	○
	Western Hemisphere Travel Initiative	○	○	○
Justice	Next Generation Identification	●	●	●
National Aeronautics and Space Administration	James Webb Space Telescope	○	○	○

Agency	Program	Establishing a comprehensive EVM system	Ensuring that data resulting from the EVM system are reliable	Ensuring that the program management team is using earned value data for decision-making purposes
	Juno	○	●	●
	Mars Science Laboratory	○	○	○
Transportation	En Route Automation Modernization	○	○	●
	Surveillance and Broadcast System	●	●	●
Veterans Affairs	Veterans Health Information Systems and Technology Architecture—Foundations Modernization	○	○	○

Key

- =The program fully implemented all EVM practices in this program management area.
- =The program partially implemented the EVM practices in this program management area.
- =The program did not implement the EVM practices in this program management area.

Source: GAO analysis of program data.

## Most Programs Did Not Fully Establish Comprehensive EVM Systems

Most programs did not fully implement the key practices needed to establish comprehensive EVM systems. Of the 16 programs, 3 fully implemented the practices in this program management area, and 13 partially implemented the practices. The Decennial Response Integration System, Next Generation Identification, and Surveillance and Broadcast System programs demonstrated that they had fully implemented the six practices in this area. For example, our analysis of the Decennial Response Integration System program schedule showed that activities were properly sequenced, realistic durations were established, and labor and material resources were assigned. The Surveillance and Broadcast System program conducted a detailed integrated baseline review to validate its performance baseline. It was also the only program to fully institutionalize EVM at the program level—meaning that it collects performance data on the contractor and government work efforts—in order to get a complete view into program status.

Thirteen programs demonstrated that they partially implemented the six key practices in this area. In most cases, programs had work breakdown structures that defined work products to an appropriate level of detail and had identified the personnel responsible for delivering these work products. However, for all 13 programs, the project schedules contained issues that undermined the quality of their performance baselines.

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Weaknesses in these schedules included the improper sequencing of activities, such as incomplete or missing linkages between tasks; a lack of resources assigned to all activities; invalid critical paths (the sequence of activities that, if delayed, will impact the planned completion date of the project); and the excessive or unjustified use of constraints, which impairs the program's ability to forecast the impact of ongoing delays on future planned work activities. These weaknesses are of concern because the schedule serves as the performance baseline against which earned value is measured. As such, poor schedules undermine the overall quality of a program's EVM system. Other key weaknesses included the following examples:

- Nine programs did not adequately determine an objective measure of earned value and develop the performance baseline—that is, key practices most appropriately addressed through a comprehensive integrated baseline review, which none of them fully performed. For example, the Air and Space Operations Center—Weapon System program conducted an integrated baseline review in May 2007 to validate one segment of work contained in the baseline; however, the program had not conducted subsequent reviews for the remaining work because doing so would preclude staff from completing their normal work activities. Other reasons cited by the programs for not performing these reviews included the lack of a fully defined scope of work or management's decision to use ongoing EVM surveillance to satisfy these practices. Without having performed a comprehensive integrated baseline review, programs have not sufficiently evaluated the validity of their baseline plan to determine whether all significant risks contained in the plan have been identified and mitigated, and that the metrics used to measure the progress made on planned work elements are appropriate.
- Four programs did not define the scope of effort using a work breakdown structure. For example, the Veterans Health Information Systems and Technology Architecture—Foundations Modernization program provided a list of its subprograms; however, it did not define the scope of the detailed work elements that comprise each subprogram. Without a work breakdown structure, programs lack a basis for planning the performance baseline and assigning responsibility for that work, both of which are necessary to accomplish a program's objectives.

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## Many Programs Did Not Fully Implement Practices to Ensure Data Reliability

Many programs did not fully ensure that their EVM data were reliable. Of the 16 programs, 7 fully implemented the practices for ensuring the reliability of the prime contractor and government performance data, and 9 partially implemented the practices. All 7 programs that demonstrated

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full implementation conduct monthly reviews of earned value data with technical engineering staff and other key personnel to ensure that the data are consistent with actual performance; perform detailed performance trend analyses to track program progress, cost, and schedule drivers; and make estimates of cost at completion. Four programs that we had previously identified as having schedule weaknesses (Farm Program Modernization; Joint Tactical Radio System—Handheld, Manpack, Small Form Fit; Juno; and Warfighter Information Network—Tactical) were aware of these issues and had sufficient controls in place to mitigate them in order to ensure that the earned value data are reliable.

Nine programs partially implemented the three practices for ensuring that earned value data are reliable. In all cases, the program had processes in place to review earned value data (from monthly contractor EVM reports in all but one case), identify and record cost and schedule variances, and forecast estimates at completion. However, 5 of these programs did not adequately analyze EVM performance data and properly record variances from the performance baseline. For example, 2 programs did not adequately document justifications for cost and schedule variances, including root causes, potential impacts, and corrective actions. Other weaknesses in this area include anomalies in monthly performance reports, such as negative dollars being spent for work performed, which impacts the validity of performance data. In addition, 7 of these programs did not demonstrate that they could adequately execute the work plan and record costs because, among other things, they were unaware of the schedule weaknesses we identified and did not have sufficient internal controls in place to deal with these issues to improve the reliability of the earned value data. Lastly, 2 of these programs could not adequately forecast estimates at completion due, in part, to anomalies in the prime contractor's EVM reports, in combination with the weaknesses contained in the project schedule.

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### Most Programs Used Earned Value Data for Decision-making Purposes

Programs were uneven in their use of earned value data to make decisions. Of the 16 programs, 9 fully implemented the practices for using earned value data for decision making, 6 partially implemented them, and 1 did not implement them. Among the 9 fully implemented programs, both the Automated Commercial Environment and Juno programs integrated their EVM and risk management processes to support the program manager in making better decisions. The Automated Commercial Environment program actively recorded risks associated with major variances from the EVM reports in the program's risk register. Juno further used the earned

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value data to analyze threats against remaining management reserve and to estimate the cost impact of these threats.

Six programs demonstrated limited capabilities in using earned value data for making decisions. In most cases, these programs included earned value performance trend data in monthly program management review briefings. However, the majority had processes for taking management action to address the cost and schedule drivers causing poor trends that were ad hoc and separate from the programs' risk management processes—and, in most cases, the risks and issues found in the EVM reports did not correspond to the risks contained in the program risk registers. In addition, 4 of these programs were not able to adequately update the performance baseline as changes occurred because, in many cases, the original baseline was not appropriately validated. For example, the Mars Science Laboratory program just recently updated its performance baseline as part of a recent replan effort. However, without validating the original and current baselines with a project-level integrated baseline review, it is unclear whether the changes to the baseline were reasonable, and whether the risks assumed in the baseline have been identified and appropriately mitigated.

One program (Veterans Health Information Systems and Technology Architecture—Foundations Modernization) was not using earned value data for decision making. Specifically, the program did not actively manage earned value performance trends, nor were these data incorporated into programwide management reviews.

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### Inconsistent Implementation Is Due in Part to Weaknesses in Policy and Lack of Enforcement

The inconsistent application of EVM across the investments exists in part because of the weaknesses we previously identified in the eight agencies' policies, as well as a lack of enforcement of the EVM policy components already in place. For example, deficiencies in all three management areas can be attributed, in part, to a lack of comprehensive EVM training requirements—which was a policy component that most agencies did not fully address. The only 3 programs that had fully implemented all key EVM practices either had comprehensive training requirements in their agency EVM policy or enforced rigorous training requirements beyond that for which the policy called. Most of the remaining programs met the minimum requirements of their agencies' policies. However, all programs that had attained full maturity in two management areas had also implemented more stringent training requirements, although none could match the efforts made on the other 3 programs. Without making this training a comprehensive requirement, these agencies are at risk that their major

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system acquisition programs will continue to have management and technical staff who lack the skills to fully implement key EVM practices.

Our case study analysis also highlighted multiple areas in which programs were not in compliance with their agencies' established EVM policies. This is an indication that agencies are not adequately enforcing program compliance. These policy areas include requiring EVM compliance at the start of the program, validating the baseline with an integrated baseline review, and conducting ongoing EVM surveillance.

Until key EVM practices are fully implemented, selected programs face an increased risk that program managers cannot effectively optimize EVM as a management tool to mitigate and reverse poor cost and schedule performance trends.

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## Earned Value Data Show Trends of Cost Overruns and Schedule Slippages on Most Programs

Earned value data trends of the 16 case study programs indicate that most are currently experiencing cost overruns and schedule slippages, and, based on our analysis, it is likely that when these programs are completed, the total cost overrun will be about \$3 billion. To date, these programs, collectively, have already overrun their original life-cycle cost estimates by almost \$2 billion (see table 5).

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**Table 5: Program Life-cycle Cost Estimate Changes**

Dollars in millions					
Agency	Program	Original life-cycle cost estimate	Current life-cycle cost estimate	Cost overruns in excess of original cost estimate	
Agriculture	Farm Program Modernization	\$451.0	\$451.0	\$0.0	
Commerce	Decennial Response Integration System	574.0 <sup>a</sup>	946.0 <sup>a</sup>	372.0	
	Field Data Collection Automation	595.7	801.1	205.4	
Defense	Air and Space Operations Center—Weapon System	4,425.0	4,425.0	0.0	
	Joint Tactical Radio System—Handheld, Manpack, Small Form Fit	19,214.0	11,599.0	n/a <sup>b</sup>	
	Warfighter Information Network—Tactical	38,157.1	38,157.1	0.0	
Homeland Security	Automated Commercial Environment	1,500.0 <sup>c</sup>	2,241.0 <sup>c</sup>	741.0	
	Integrated Deepwater System—Common Operational Picture	1,353.0 <sup>c</sup>	1,353.0 <sup>c</sup>	0.0	

Dollars in millions

Agency	Program	Original life-cycle cost estimate	Current life-cycle cost estimate	Cost overruns in excess of original cost estimate
	Western Hemisphere Travel Initiative	1,228.0	1,228.0	0.0
Justice	Next Generation Identification	1,075.9	1,075.9	0.0
National Aeronautics and Space Administration	James Webb Space Telescope	4,964.0	4,964.0	0.0
	Juno	1,050.0	1,050.0	0.0
	Mars Science Laboratory	1,634.0	2,286.0	652.0
Transportation	En Route Automation Modernization	3,649.4	3,649.4	0.0
	Surveillance and Broadcast System	4,313.0	4,328.9	15.9
Veterans Affairs	Veterans Health Information Systems and Technology Architecture—Foundations Modernization	1,897.4	1,897.4	0.0
<b>Total</b>			<b>\$1,986.3 billion</b>	

Source: GAO analysis of program and contractor data.

<sup>a</sup>We removed \$37 million from the original estimate, which represented costs associated with the closeout of the program. We did this because the current estimate does not include costs for these activities. An estimate for these activities is currently being revised. In addition, the cost increase associated with the current estimate is due, in part, to an agency-directed expansion of program scope (related to the system's ability to process a higher volume of paper forms) in April 2008.

<sup>b</sup>It is not appropriate to compare the original and current life-cycle cost estimates for this program because the scope has significantly changed since inception (such as newly imposed security requirements). In addition, due to a change in the agency's migration strategy for replacing legacy radios with new tactical radios, the planned quantity of radios procured was decreased from 328,514 to 95,551. As a result, the life-cycle cost estimate was reduced and no longer represents the original scope of the program.

<sup>c</sup>The original and current life-cycle costs do not include operations and maintenance costs.

Taking the current earned value performance<sup>15</sup> into account, our analysis of the 16 case study programs indicated that most are experiencing shortfalls against their currently planned cost and schedule targets. Specifically, earned value performance data over a 12-month period

<sup>15</sup>In 13 cases, programs limited the use of EVM to system development work on contract. As such, earned value data will reflect contractor performance only. In the 3 other cases, the Farm Program Modernization, Surveillance and Broadcast System, and Veterans Health Information Systems and Technology Architecture—Foundations Modernization, programs expanded the use of EVM to the entire program; therefore, the earned value data will reflect total program performance (contractor and government).

showed that the 16 programs combined have exceeded their cost targets by \$275 million. During that period, they also experienced schedule variances and were unable to accomplish almost \$93 million worth of planned work. In most cases, the negative cost and schedule performance trends were attributed to ongoing technical issues in the development or testing of system components.

Furthermore, our projections of future estimated costs at completion based on our analysis of current contractor performance trends indicate that these programs will most likely continue to experience cost overruns to completion, totaling almost \$1 billion. In contrast, the programs' contractors estimate the cost overruns at completion will be approximately \$469.7 million. These estimates are based on the contractors' assumption that their efficiency in completing the remaining work will significantly improve over what has been done to date. Furthermore, it should be noted that in 4 cases, the contractor-estimated overrun is smaller than the cost variances they have already accumulated—which is an indication that these estimates are aggressively optimistic.<sup>16</sup>

With the inclusion of the overruns already incurred to date, the total increase in life-cycle costs will be about \$3 billion. Our analysis is presented in table 6. Additional details on the 16 case studies are provided in appendix II.

**Table 6: Contractor Cumulative Cost and Schedule Performances**

Dollars in millions							
Agency	Program	Contractor budget at completion	Percentage complete	Cumulative cost variance	Cumulative schedule variance	Contractor-estimated cost overrun/underrun at completion	GAO most likely cost overrun/underrun at completion
Agriculture	Farm Program Modernization <sup>a,b</sup>	\$7.0	94%	\$<0.1	(\$0.2)	\$<0.1	\$<0.1
Commerce	Decennial Response Integration System	468.6	50	13.6	2.3	7.0 underrun	7.0 underrun

<sup>16</sup>These programs include the Field Data Collection Automation, Automated Commercial Environment, Juno, and Veterans Health Information Systems and Technology Architecture—Foundations Modernization.

Dollars in millions

Agency	Program	Contractor budget at completion	Percentage complete	Cumulative cost variance	Cumulative schedule variance	Contractor-estimated cost overrun/underrun at completion	GAO most likely cost overrun/underrun at completion
Defense	Field Data Collection Automation	555.6	75	(3.5)	0.4	2.9 overrun	4.6 overrun
	Air and Space Operations Center—Weapon System	171.3	86	(0.1)	0.4	0.8 overrun	0.8 overrun
	Joint Tactical Radio System—Handheld, Manpack, Small Form Fit	530.8	74	(62.4)	(8.8)	70.1 overrun	89.1 overrun
Homeland Security	Warfighter Information Network—Tactical	747.0	34	0.8	(12.0)	3.7 underrun	15.1 overrun
	Automated Commercial Environment	382.3	83	(18.8)	(13.2)	0.5 underrun	24.1 overrun
	Integrated Deepwater System—Common Operational Picture	130.2	99	(4.2)	0.0	4.2 overrun	4.2 overrun
Justice	Western Hemisphere Travel Initiative <sup>c</sup>	45.3	100	n/a	n/a	n/a	n/a
	Next Generation Identification	37.5	91	(1.4)	(0.5)	1.5 overrun	1.6 overrun
National Aeronautics and Space Administration	James Webb Space Telescope	1,271.6	64	(224.7)	(9.4)	448.5 overrun <sup>d</sup>	448.5 overrun
	Juno	369.0	32	(13.2)	(12.3)	6.4 overrun	49.8 overrun
	Mars Science Laboratory <sup>e</sup>	1,223.0	77	2.2	(6.2)	4.1 overrun	n/a
Transportation	En Route Automation Modernization	1,480.2	89	36.9	15.9	15.3 underrun	15.3 underrun
	Surveillance and Broadcast System <sup>a</sup>	1,007.9	27	14.7	(24.0)	41.6 underrun	21.7 overrun
Veterans Affairs	Veterans Health Information Systems and Technology Architecture—Foundations Modernization <sup>b</sup>	1,897.4	10	(14.9)	(24.9)	0.7 underrun	350.2 overrun
<b>Total</b>		<b>\$10,324.7</b>		<b>\$275.0 overrun</b>	<b>\$92.5 overrun</b>	<b>\$469.7 overrun</b>	<b>\$987.4 overrun</b>

Source: GAO analysis of program and contractor data.

<sup>a</sup>Earned value data reflect performance for the full scope of the program.

<sup>b</sup>This program is currently in the initiation phase of its life cycle, and the budget at completion reflects only work planned to be completed in this phase.

<sup>c</sup>The program's contractor completed development work in June 2009.

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<sup>4</sup>Project officials stated that they have adequate contingency reserves built into their life-cycle cost estimate to cover this estimated overrun and any additional overruns (should performance continue to degrade) through contract completion.

<sup>5</sup>EVM reporting was suspended between November 2008 and February 2009 while the project was being replanned; therefore, we did not have sufficient data to make a reliable independent estimate at completion.

Eleven programs are expected to incur a cost overrun at contract completion. In particular, two programs (i.e., the James Webb Space Telescope and Veterans Health Information Systems and Technology Architecture—Foundations Modernization programs) will likely experience a combined overrun of \$798.7 million, which accounts for about 80 percent of our total projection.

With timely and effective action taken by program and executive management, it is possible to reverse negative performance trends so that the projected cost overruns at completion may be reduced. To get such results, management at all levels could be strengthened, including contractor management, program office management, and executive-level management. For example, programs could strengthen program office controls and contractor oversight by obtaining earned value data weekly (instead of monthly) so that they can make decisions with immediate and greater impact. Additionally, key risks could be elevated to the program level and, if necessary, to the executive level to ensure that appropriate mitigation plans are in place and that they are tracked to closure.

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## Conclusions

Key agencies have taken a number of important steps to improve the management of major acquisitions through the implementation of EVM. Specifically, the agencies have established EVM policies and require their major system acquisition programs to use EVM. However, none of the eight agencies that we reviewed have comprehensive EVM policies. Most of these policies omit or lack sufficient guidance on the type of work structure needed to effectively use EVM data and on the training requirements for all relevant personnel. Without comprehensive policies, it will be difficult for the agencies to gain the full benefits of EVM.

Few of our 16 case study programs had fully implemented EVM capabilities, raising concerns that programs cannot efficiently produce reliable estimates of cost at completion. Many of these weaknesses found on these programs can be traced back to inadequate agency EVM policies and raise questions concerning the agencies' enforcement of the policies already established, including the completion of the integrated baseline reviews and system surveillance. Until agencies expand and enforce their

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EVM policies, it will be difficult for them to optimize the effectiveness of this management tool, and they will face an increased risk that managers are not getting the information they need to effectively manage the programs.

In addition to concerns about their implementation of EVM, the programs' earned value data show trends toward cost overruns that are likely to collectively total about \$3 billion. Without timely and aggressive management action, this projected overrun will be realized, resulting in the expenditure of over \$1 billion more than currently planned.

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## Recommendations for Executive Action

To address the weaknesses identified in agencies' policies and practices in using EVM, we are making recommendations to the eight major agencies included in this review. Specifically, we recommend that the following three actions be taken by the Secretaries of the Departments of Agriculture, Commerce, Defense, Homeland Security, Justice, Transportation, and Veterans Affairs and the Administrator of the National Aeronautics and Space Administration:

- modify policies governing EVM to ensure that they address the weaknesses that we identified, taking into consideration the criteria used in this report;
- direct key system acquisition programs to implement the EVM practices that address the detailed weaknesses that we identified in appendix II, taking into consideration the criteria used in this report; and
- direct key system acquisition programs to take action to reverse current negative performance trends, as shown in the earned value data, to mitigate the potential cost and schedule overruns.

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## Agency Comments and Our Evaluation

We provided the selected eight agencies with a draft of our report for review and comment. The Department of Homeland Security responded that it had no comments. The remaining seven agencies generally agreed with our results and recommendations. Agencies also provided technical comments, which we incorporated in the report as appropriate.

The comments of the agencies are summarized in the following text:

- In e-mail comments on a draft of the report, officials from the U.S. Department of Agriculture's Office of the Chief Information Officer stated

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that the department has begun to address the weaknesses in its EVM policy identified in the report.

- In written comments on a draft of the report, the Secretary of Commerce stated that, regarding the second and third recommendations, the Department of Commerce was pleased that the Decennial Response Integration System was found to have fully implemented all 11 key EVM practices, and that the Field Data Collection Automation program fully implemented six key practices. The department added that its recent actions on the Field Data Collection Automation program should move this program to full compliance with the key EVM practices. Furthermore, regarding the first recommendation, the Secretary stated that while the department understands and appreciates the value of standardized work breakdown structures, it maintained that the development of these work structures should take place at the department's operating units (e.g., Census Bureau), given the wide diversity of missions and project complexity among these units. As noted in our report, we agree that agencies could develop standard work structures based on the kinds of work being performed by the various component agencies. Therefore, we support these efforts described by the department because they are generally consistent with the intent of our recommendation. Commerce's comments are printed in appendix III.
- In written comments on a draft of the report, the Department of Defense's Director of Defense Procurement and Acquisition Policy stated that the department concurred with our recommendations. Among other things, DOD stated that it is essential to maintain the appropriate oversight of acquisition programs, including the use of EVM data to understand program status and anticipate potential problems. DOD's comments are printed in appendix IV.
- In written comments on a draft of the report, the Department of Justice's Assistant Attorney General for Administration stated that, after discussion with our office, it was agreed that the second recommendation, related to implementing EVM practices that address identified weakness, was inadvertently directed to the department, and that no response was necessary. We agreed because the case study program reviewed fully met all key EVM practices. The department concurred with the two remaining recommendations related to modifying EVM policies and reversing negative performance trends. Furthermore, the Assistant Attorney General noted that Justice had begun to take steps to improve its use of EVM, such as modifying its policy to require EVM training for all personnel with investment oversight and program management responsibilities. Justice's comments are printed in appendix V.

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- In written comments on a draft of the report, the National Aeronautics and Space Administration's Deputy Administrator stated that the agency concurred with two recommendations and partially concurred with one recommendation. In particular, the Deputy Administrator agreed that opportunities exist for improving the implementation of EVM, but stated that NASA classifies the projects included in the scope of the audit as space flight projects (not as IT-specific projects), which affects the applicability of the agency's EVM policies and guidance that were reviewed. We recognize that different classifications of IT exist; however, consistent with other programs included in the audit, the selected NASA projects integrate and rely on various elements of IT. As such, we reviewed both the agency's space flight and IT-specific guidance. Furthermore, the agency partially concurred with one recommendation because it stated that efforts were either under way or planned that will address the weaknesses we identified. We support the efforts that NASA described in its comments because they are generally consistent with the intent of our recommendation. NASA's comments are printed in appendix VI.
- In e-mail comments on a draft of the report, the Department of Transportation's Director of Audit Relations stated that the department is taking immediate steps to modify its policies governing EVM, taking into consideration the criteria used in the draft report.
- In written comments on a draft of the report, the Secretary of Veterans Affairs stated that the Department of Veterans Affairs generally agreed with our conclusions and concurred with our recommendations. Furthermore, the Secretary stated that Veterans Affairs has initiatives under way to address the weaknesses identified in the report. Veterans Affairs' comments are printed in appendix VII.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to interested congressional committees; the Secretaries of the Departments of Agriculture, Commerce, Defense, Homeland Security, Justice, Transportation, and Veterans Affairs; the Administrator of the National Aeronautics and Space Administration; and other interested parties. In addition, the report will be available at no charge on our Web site at <http://www.gao.gov>.

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If you or your staff have any questions on the matters discussed in this report, please contact me at (202) 512-9286 or pownerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VIII.

Sincerely yours,

A handwritten signature in black ink, appearing to read "David A. Powner".

David A. Powner  
Director, Information Technology  
Management Issues

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# Appendix I: Objectives, Scope, and Methodology

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Our objectives were to (1) assess whether key departments and agencies have appropriately established earned value management (EVM) policies, (2) determine whether these agencies are adequately using earned value techniques to manage key system acquisitions, and (3) evaluate the earned value data of these selected investments to determine their cost and schedule performances.

For this governmentwide review, we assessed eight agencies and 16 investments. We initially identified the 10 agencies with the highest amount of spending for information technology (IT) development, modernization, and enhancement work as reported in the Office of Management and Budget's (OMB) Fiscal Year 2009 Exhibit 53. These agencies were the Departments of Agriculture, Commerce, Defense, Health and Human Services, Homeland Security, Justice, Transportation, the Treasury, and Veterans Affairs and the National Aeronautics and Space Administration. We excluded Treasury from our selection because we recently performed an extensive review of EVM at that agency.<sup>1</sup> We also subsequently removed Health and Human Services from our selection because the agency did not have investments in system acquisition that met our dollar threshold (as defined in the following text). The resulting eight agencies also made up about 75 percent of the government's planned IT spending for fiscal year 2009.

To ensure that we examined significant investments, we chose from investments (related to system acquisition) that were expected to receive development, modernization, and enhancement funding in fiscal year 2009 in excess of \$90 million.<sup>2</sup> We limited the number of selected investments to a maximum of 3 per agency. For agencies with more than 3 investments that met our threshold, we selected the top 3 investments with the highest planned spending. For agencies with 3 or fewer such investments, we chose all of the investments meeting our dollar threshold. Lastly, we excluded investments with related EVM work already under way at GAO.<sup>3</sup>

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<sup>1</sup>GAO, *Information Technology: Treasury Needs to Better Define and Implement Its Earned Value Management Policy*, GAO-08-951 (Washington, D.C.: Sept. 22, 2008).

<sup>2</sup>There were 30 investments that met this criterion.

<sup>3</sup>These investments include the Department of Defense's Navy Enterprise Resource Planning, and the Department of Homeland Security's Secure Border Initiative net and U.S. Visitor and Immigration Status Indicator Technology.

To assess whether key agencies have appropriately established EVM policies, we analyzed agency policies and guidance for EVM. Specifically, we compared these policies and guidance documents with both OMB's requirements and key best practices recognized within the federal government and industry for the implementation of EVM. These best practices are contained in the GAO cost guide.<sup>4</sup> We also interviewed key agency officials to obtain information on their ongoing and future EVM plans.

To determine whether these agencies are adequately using earned value techniques to manage key system acquisitions, we analyzed program documentation, including project work breakdown structures, project schedules, integrated baseline review briefings, risk registers, and monthly management briefings for the 16 selected investments. Specifically, we compared program documentation with EVM and scheduling best practices as identified in the cost guide.<sup>5</sup> We determined whether the program implemented, partially implemented, or did not implement each of the 11 practices. We also interviewed program officials (and observed key program status review meetings) to obtain clarification on how EVM practices are implemented and how the data are used for decision-making purposes.

To evaluate the earned value data of the selected investments to determine their cost and schedule performances, we analyzed the earned value data contained in contractor EVM performance reports obtained from the programs. To perform this analysis, we compared the cost of work completed with budgeted costs for scheduled work for a 12-month period to show trends in cost and schedule performances. We also used data from these reports to estimate the likely costs at completion through established earned value formulas. This resulted in three different values, with the middle value being the most likely. To assess the reliability of the cost data, we compared it with other available supporting documents (including OMB and agency financial reports); electronically tested the data to identify obvious problems with completeness or accuracy; and interviewed agency and program officials about the data. For the purposes of this report, we determined that the cost data were sufficiently reliable. We did not test the adequacy of the agency or contractor cost-accounting

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<sup>4</sup>GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP (Washington, D.C.: March 2009).

<sup>5</sup>GAO-09-3SP.

systems. Our evaluation of these cost data was based on what we were told by the agency and the information they could provide.

We conducted this performance audit from February to October 2009 at the agencies' offices in the Washington, D.C., metropolitan area; Fort Monmouth, New Jersey; Jet Propulsion Lab, Pasadena, California; Hanscom Air Force Base, Massachusetts; and Naval Base San Diego, California. Our work was done in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix II: Case Studies of Selected Programs' Implementation of Earned Value Management

We conducted case studies of 16 major system acquisition programs (see table 7). For each of these programs, the remaining sections of this appendix provide the following: a brief description of the program, including a graphic illustration of the investment's life cycle; an assessment of the program's implementation of the 11 key EVM practices; and an analysis of the program's recent earned value (EV) data and trends. These data and trends are often described in terms of cost and schedule variances. Cost variances compare the earned value of the completed work with the actual cost of the work performed. Schedule variances are also measured in dollars, but they compare the earned value of the completed work with the value of the work that was expected to be completed. Positive variances are good—they indicate that activities are costing less than expected or are completed ahead of schedule. Negative variances are bad—they indicate activities are costing more than expected or are falling behind schedule.

**Table 7: Sixteen Case Study Programs**

Agency	Program
Agriculture	Farm Program Modernization
Commerce	Decennial Response Integration System
	Field Data Collection Automation
Defense	Air and Space Operations Center—Weapon System
	Joint Tactical Radio System—Handheld, Manpack, Small Form Fit
	Warfighter Information Network—Tactical
Homeland Security	Automated Commercial Environment
	Integrated Deepwater System—Common Operational Picture
	Western Hemisphere Travel Initiative
Justice	Next Generation Identification
National Aeronautics and Space Administration	James Webb Space Telescope
	Juno
	Mars Science Laboratory
Transportation	En Route Automation Modernization
	Surveillance and Broadcast System
Veterans Affairs	Veterans Health Information Systems and Technology Architecture—Foundations Modernization

Source: GAO analysis of program data.

The following information describes the key that we used in tables 8 through 23 to convey the results of our assessment of the 16 case study programs' implementation of the 11 EVM practices.

<b>Key description</b>	<b>Key symbol</b>
The program fully implemented all EVM practices in this program management area.	●
The program partially implemented the EVM practices in this program management area.	○
The program did not implement the EVM practices in this program management area.	○

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**Appendix II: Case Studies of Selected  
Programs' Implementation of Earned Value  
Management**

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## Farm Program Modernization

### Investment Details

Department of Agriculture (Farm Service Agency)

Program start date: 2004

Total life-cycle cost:

- Current: \$451 million
- Original: \$451 million

Program end date:

- Current: 2018
- Original: 2017

Rebaselines: 1 (September 2008)

Major contractor: Prime contract to be awarded in the first quarter of FY 2010

The Farm Program Modernization (MIDAS) program is intended to address the long-term needs in delivering farm benefit programs via business process reengineering and implementation of a commercial off-the-shelf enterprise resource planning solution. MIDAS is an initiative of the Farm Service Agency, which is responsible for administering 35 farm benefit programs. To support these programs, the agency uses two primary systems—a distributed network of legacy computers and a centralized Web farm (to store customer data and host Web-based applications)—both of which have shortcomings. While MIDAS is to replace these computers, it is also intended to provide new applications and redesigned business processes. The Web farm is expected to remain in operation in a supporting role for the program. Currently, MIDAS is in the initiation phase of its life cycle and plans to award the system integration contract in the first quarter of fiscal year 2010.



Source: GAO analysis of U.S. Department of Agriculture (Farm Service Agency) data.

**Table 8: GAO EVM Practice Assessment of Agriculture's MIDAS Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of U.S. Department of Agriculture (Farm Service Agency) data.

MIDAS fully met 6 of the 11 key practices for implementing EVM and partially met 5 practices. Specifically, a key weakness in the EVM system is the lack of a comprehensive integrated baseline review. Instead, MIDAS focused solely on evaluating the program's compliance with industry standards and chose not to validate the quality of the baseline. Program officials stated that they plan to conduct a full review to address the risks and realism of the baseline after the prime contract has been awarded. Furthermore, while the MIDAS schedule is generally sound, resources were not assigned to all activities, and the critical path (the longest duration path through the sequenced list of key activities) could not be identified because the current schedule ends in September 2009. Finally, MIDAS met all key practices associated with data reliability, such as executing the work plan and recording costs, as well as all key practices for decision making.

#### EV Performance Details

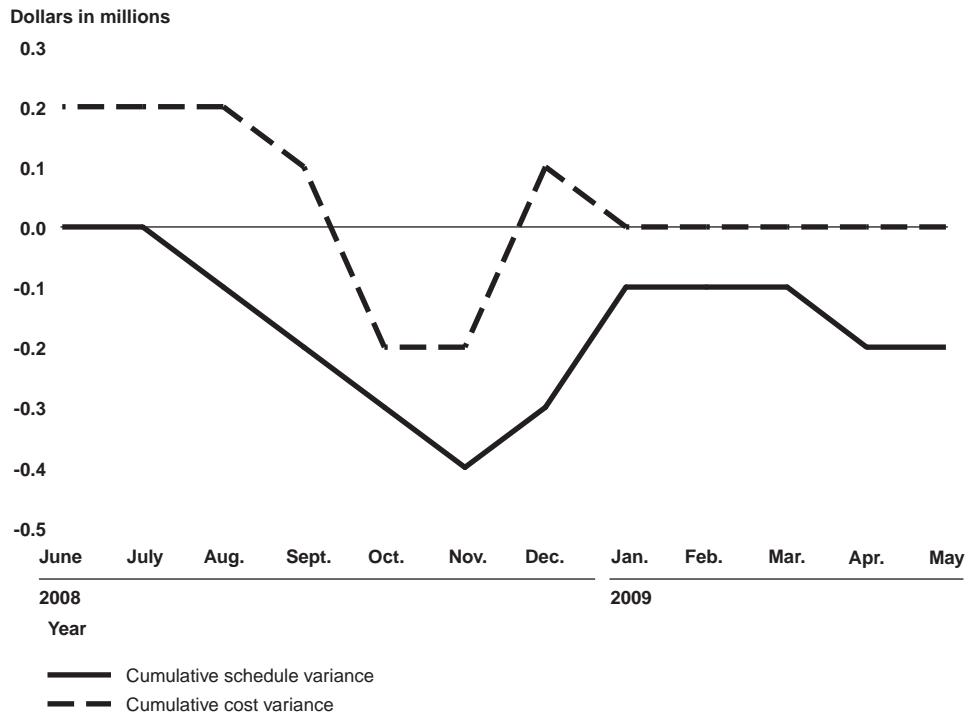
Based on performance data from June 2008 to May 2009, MIDAS generally met its planned cost targets. However, at the same time the program consistently has had negative schedule variances, indicating that work is slightly behind schedule. Reasons for this slippage include work being accomplished less efficiently than planned, with some activities, such as the acquisition of a project management information system, being delayed. We concur with the program's estimate that it will meet its current budget at completion—worth approximately \$7.0 million—for program initiation activities.

Program percent complete: 94%

Estimates at completion:

- Program: \$6.9 million
- GAO: \$6.9 million

**Figure 1: GAO EV Data Analysis of Agriculture's MIDAS Program**



Source: GAO analysis of U.S. Department of Agriculture (Farm Service Agency) data.

## Decennial Response Integration System

### Investment Details

Department of Commerce (Census Bureau)

Program start date: March 2006

Total life-cycle cost:

- Current: \$946 million
- Original: \$574 million

Program end date:

- Current: September 2013
- Original: September 2013

Rebaselines: 0

Major contractor: Lockheed Martin

The Decennial Response Integration System (DRIS) is to be used during the 2010 Census for collecting and integrating census responses from all sources, including forms and telephone interviews. The system is to improve accuracy and timeliness by standardizing the response data and providing the data to other Census Bureau systems for analysis and processing. Among other things, DRIS is expected to process census data provided by respondents via census forms, telephone agents, and enumerators; assist the public via telephone; and monitor the quality and status of data capture operations. The DRIS program's estimated life-cycle costs have increased by \$372 million, which is mostly due to increases in both paper and telephone workloads. For example, the paper workload increased due to an April 2008 redesign of the 2010 Census that reverted planned automated operations to paper-based processes and requires DRIS to process an additional estimated 40 million paper forms.



Source: GAO analysis of Department of Commerce (Census Bureau) data.

**Table 9: GAO EVM Practice Assessment of Commerce's DRIS Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Commerce (Census Bureau) data.

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## Appendix II: Case Studies of Selected Programs' Implementation of Earned Value Management

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DRIS fully implemented all 11 of the key EVM practices necessary to manage its system acquisition program. Specifically, the program implemented all practices for establishing a comprehensive EVM system, such as defining the scope of work and scheduling the work. The program's schedule appropriately captured and sequenced key activities and assigned realistic resources to all key activities. Furthermore, the DRIS team ensured that the resulting EVM data were appropriately verified and validated for reliability by analyzing performance data to identify the magnitude and effect of problems causing key variances, tracking related risks in the program's risks register, and performing quality checks of the schedule and critical path. Lastly, the DRIS program management team conducted rigorous reviews of EV performance on a monthly basis and took the appropriate management actions to mitigate risks.

### EV Performance Details

Based on performance data from June 2008 to May 2009, the DRIS contractor has outperformed its planned cost targets by \$13.6 million. For this same period, it has also outperformed its schedule targets by completing \$2.3 million worth of work ahead of schedule. We concur with the contractor's estimate that it will underrun its current budget—worth approximately \$468.6 million—by \$7.0 million.

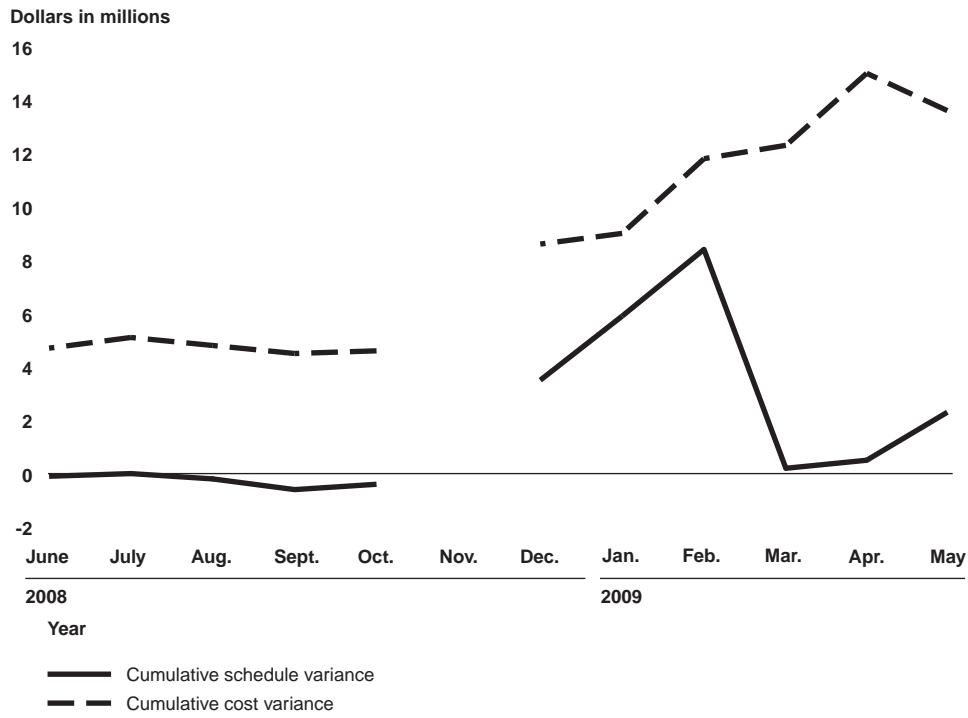
Contract percent complete: 50%

Estimates at completion:

- Contractor: \$461.7 million
- GAO: \$461.7 million

Note: The DRIS contractor did not report EV data in November 2008.

**Figure 2: GAO EV Data Analysis of Commerce's DRIS Program**



Source: GAO analysis of Department of Commerce (Census Bureau) data.

## Field Data Collection Automation

### Investment Details

Department of Commerce (Census Bureau)

Program start date: March 2006

Total life-cycle cost:

- Current: \$801.1 million
- Original: \$595.7 million

Program end date:

- Current: December 2011
- Original: December 2011

Rebaselines: 1 (October 2008)

Major contractor: Harris Corporation

The Field Data Collection Automation (FDCA) program is intended to provide automation support for the 2010 Census field data collection operations. The program includes the development of handheld computers for identifying and correcting addresses for all known living quarters in the United States (known as address canvassing) and the systems, equipment, and infrastructure that field staff will use to collect data. FDCA handheld computers were originally to be used for other census field operations, such as following up with nonrespondents through personal interviews. However, in April 2008, due to problems identified during testing and cost overruns and schedule slippages in the FDCA program, the Secretary of Commerce announced a redesign of the 2010 Census, and rebaselined FDCA in October 2008. As a result, FDCA's life-cycle costs have increased from an estimated \$596 million to \$801 million, a \$205 million increase. Furthermore, the responsibility for the design, development, and testing of IT systems for other key field operations was moved from the FDCA contractor to the Census Bureau.



Source: GAO analysis of Department of Commerce (Census Bureau) data.

**Table 10: GAO EVM Practice Assessment of Commerce's FDCA Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	○
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	○
	Analyze EVM performance data and record variances from the performance measurement baseline plan	○
	Forecast estimates at completion	○
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	○
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Commerce (Census Bureau) data.

FDCA fully met 6 of the 11 key practices for implementing EVM and partially met 5 others. Specifically, the program fully met most practices for establishing a comprehensive EVM system, such as defining the scope of the work effort; however, it only partially met the practice for scheduling the work. Specifically, the program schedule contained weaknesses, including key milestones with fixed completion dates—which hampers the program's ability to see the impact of delays experienced on open tasks on successor tasks. As such, the FDCA program cannot use the schedule as an active management tool. Furthermore, anomalies in the prime contractor's EVM reports, combined with weaknesses in the master schedule, affect FDCA's ability to execute the work plan, analyze variances, and make reliable estimates of cost at completion. Lastly, cost and schedule drivers identified in EVM reports were not fully consistent with the program's risk register, which prevents the program from taking the appropriate management action to mitigate risks and effectively using EV data for decisions.

#### EV Performance Details

Due to contractor performance issues, the FDCA program established a new program baseline in October 2008. Based on performance data from October 2008 to May 2009, the contractor has currently exceeded its revised cost target by \$3.5 million. We estimate that the FDCA contract will overrun its current budget—worth approximately \$555.6 million—by \$4.6 million. Our analysis indicates that the rebaselined contract is currently on schedule.

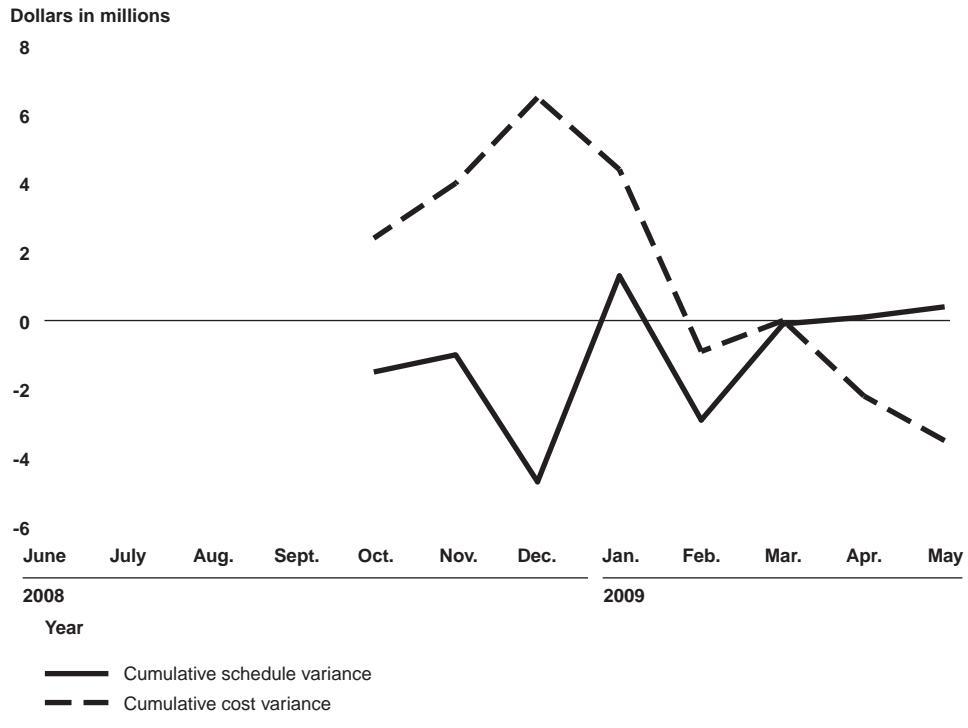
Contract percent complete: 75%

Estimates at completion:

- Contractor: \$558.5 million
- GAO: \$560.2 million

Note: EV data between June 2008 and September 2008 did not reflect actual program performance because the program was rebaselining; therefore, these data have been omitted.

**Figure 3: GAO EV Data Analysis of Commerce's FDCA Program**



## Air and Space Operations Center—Weapon System

### Investment Details

Department of Defense (Department of the Air Force)

Program start date: September 2000

Total life-cycle cost:

- Current: \$4.425 billion
- Original: \$4.425 billion

Program end date:

- Current: September 2023
- Original: September 2023

Rebaselines: 0

Major contractor: Lockheed Martin

The Air and Space Operations Center—Weapon System (AOC) is the air and space operations planning, execution, and assessment system for the Joint Force Air Component Commander. According to the agency, there are currently 11 AOCs located around the world, each aligned to the Combatant Commands of the Unified Command Plan, with additional support units for training, help desk, testing, and contingency manpower augmentation. Each AOC is designed to enable commanders to exercise command and control of air, space, information operations, and combat support forces to achieve the objectives of the joint force commander and combatant commander in joint and coalition military operations. As such, the AOC system is intended as the planning and execution engine of any air campaign.



Source: GAO analysis of Department of Defense (Department of the Air Force) data.

**Table 11: GAO EVM Practice Assessment of Defense's AOC Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	○
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	○
	Develop the performance measurement baseline	○
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	○
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Defense (Department of the Air Force) data.

AOC fully met 7 of the 11 key practices and partially met 4 others. AOC applied EVM at the contract level and has a capable government team that has made it an integral part of project management. AOC performed detailed analyses of the EV data and reviews the data with engineering staff to ensure that the appropriate metrics have been applied for accurate reporting. AOC has also integrated EVM with its risk management processes to ensure that resources are applied to watch or mitigate risks associated with the cost and schedule drivers reported in the EVM reports. Weaknesses found in AOC's EVM processes relate to the development and validation of the contractor baseline. In particular, AOC has not performed an integrated baseline review for all work that is currently on contract. The master schedule also contained issues, such as a high number of converging tasks and out-of-sequence tasks, that hamper AOC's ability to determine the start dates of future tasks. Taken together, these issues undermine the reliability of the schedule as a baseline to measure EV performance.

#### EV Performance Details

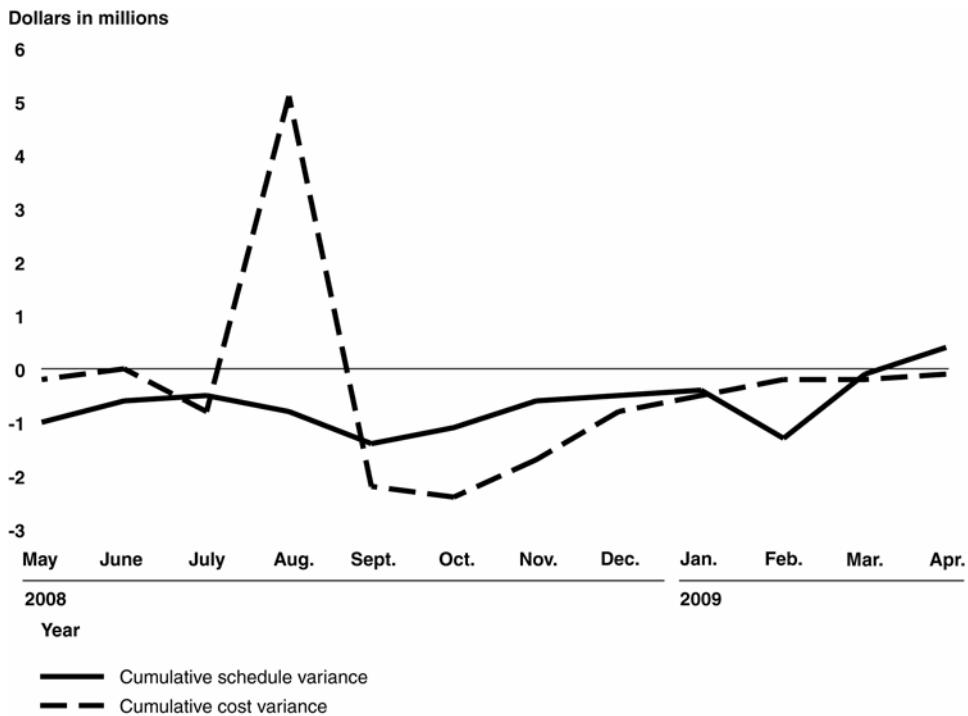
As of April 2009, the AOC contractor has overrun its planned cost targets by \$58,000. However, for this same period, it has completed \$422,000 worth of work ahead of schedule. Based on the performance data from May 2008 to April 2009, we concur with the contractor's estimate that it will overrun its current budget—worth approximately \$171.3 million—by \$793,000.

Contract percent complete: 86%

Estimates at completion:

- Contractor: \$172.1 million
- GAO: \$172.1 million

**Figure 4: GAO EV Data Analysis of Defense's AOC Program**



Source: GAO analysis of Department of Defense (Department of the Air Force) data.

## Joint Tactical Radio System—Handheld, Manpack, Small Form Fit

### Investment Details

Department of Defense (Joint—Department of the Navy Lead)

Program start date: April 2004

Total life-cycle cost:

- Current: \$11.559 billion
- Original: \$19.214 billion

Program end date:

- Current: 2048
- Original: 2045

Rebaselines: 1 (June 2006)

Major contractor: General Dynamics C4 Systems

The Joint Tactical Radio System (JTRS) program is developing software-defined radios that are expected to interoperate with existing radios and increase communications and networking capabilities. The JTRS-Handheld, Manpack, Small Form Fit (HMS) product office, within the JTRS Ground Domain program office, is developing handheld, manpack, and small form fit radios. In 2006, the program was restructured to include two concurrent phases of development. Phase I includes select small form fit radios, while Phase II includes small form fit radios with enhanced security as well as handheld and manpack variants. Subsequent to the program's restructure, the department updated its migration strategy for replacing legacy radios with new tactical radios. As such, the total planned quantity of JTRS-HMS radios was reduced from an original baseline of 328,514—established in May 2004—to 95,551. As a result, the total life-cycle cost of the JTRS-HMS program was reduced from an estimated \$19.2 billion to \$11.6 billion, a \$7.6 billion decrease.



Source: GAO analysis of Department of Defense (Joint—Department of the Navy Lead) data.

**Table 12: GAO EVM Practice Assessment of Defense's JTRS-HMS Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	○
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Defense (Joint—Department of the Navy Lead) data.

JTRS-HMS fully met 10 of the 11 key practices and partially met 1 practice. Specifically, JTRS-HMS implemented most practices for establishing a comprehensive EVM system, such as performing rigorous reviews to validate the baseline; however, the current schedule contained some weaknesses, such as out-of-sequence logic and activities without resources assigned. Program officials were aware of these issues and attributed them to weaknesses in subcontractor schedules that are integrated on a monthly basis. The JTRS-HMS program fully met practices for ensuring that the resulting EV data were appropriately verified and validated for reliability and demonstrated that the program management team was using these data for decision-making purposes.

#### EV Performance Details

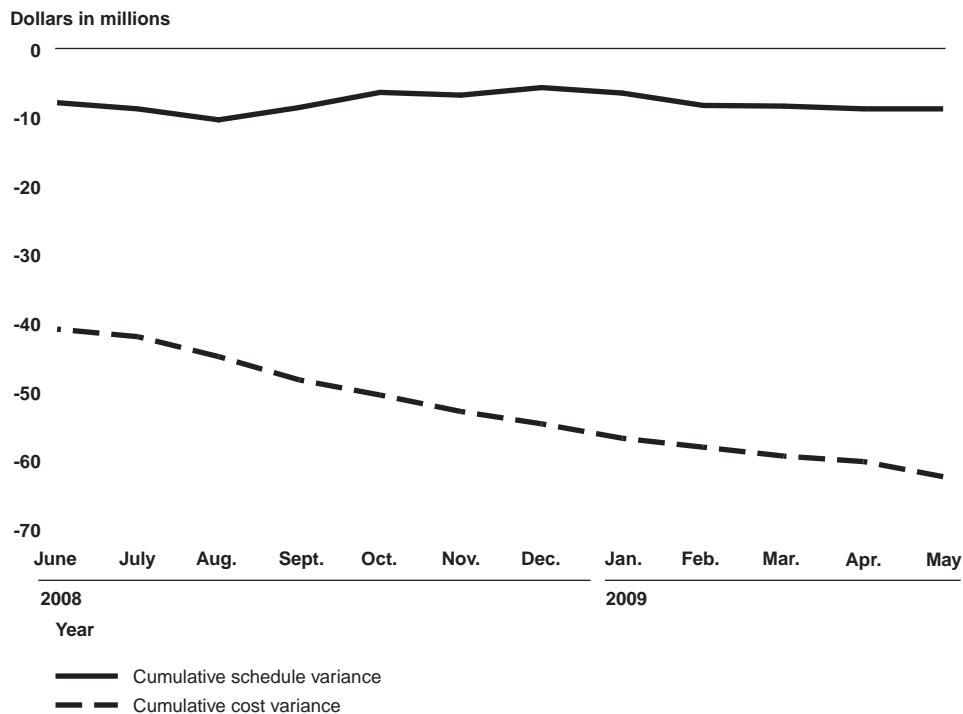
Based on performance data from June 2008 to May 2009, the JTRS-HMS contractor has experienced negative cost and schedule variances. Specifically, as of May 2009, the contractor has exceeded its planned cost target by \$62.4 million. We estimate that the JTRS-HMS contract will overrun its current budget—worth approximately \$530.8 million—by \$89.1 million. Furthermore, as of May 2009, JTRS-HMS has not completed \$8.8 million in planned work. Both cost and schedule variances are primarily due to radio hardware development, including design issues related to hardware miniaturization.

Contract percent complete: 74%

Estimates at completion:

- Contractor: \$600.9 million
- GAO: \$619.9 million

**Figure 5: GAO EV Data Analysis of Defense's JTRS-HMS Program**



Source: GAO analysis of Department of Defense (Joint—Department of the Navy Lead) data.

## Warfighter Information Network—Tactical

### Investment Details

Department of Defense (Department of the Army)

Program start date: July 2003

Total life-cycle cost:

- Current: \$38.157 billion
- Original: \$38.157 billion

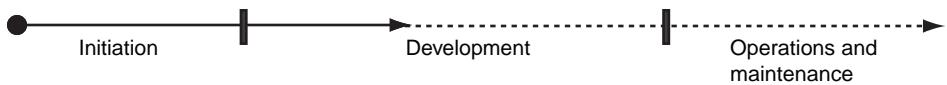
Program end date:

- Current: 2025
- Original: 2025

Rebaselines: 1 (June 2007)

Major contractor: General Dynamics C4 Systems

The Warfighter Information Network—Tactical (WIN-T) program is designed to be the Army's high-speed and high-capacity backbone communications network. The program connects Department of the Army units with higher levels of command and provides the Army's tactical portion of the Global Information Grid—a Department of Defense initiative aimed at building a secure network and set of information capabilities modeled after the Internet. WIN-T was restructured in June 2007 following a unit cost increase above the critical cost growth threshold (known as a Nunn-McCurdy breach). As a result of the restructuring, it was determined that WIN-T would be fielded in four increments. The third increment is expected to provide the Army with a full networking on-the-move capability and fully support the Army's Future Combat Systems. In May 2009, the Increment 3 program baseline was approved, and the life-cycle cost for the program was estimated at \$38.2 billion. Our assessment of EVM practices and EV data was performed on WIN-T Increment 3.



Source: GAO analysis of Department of Defense (Department of the Army) data.

**Table 13: GAO EVM Practice Assessment of Defense's WIN-T Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	○
	Develop the performance measurement baseline	○
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	○

Source: GAO analysis of Department of Defense (Department of the Army) data.

WIN-T fully met 7 of the 11 key practices for implementing EVM, partially met 1 practice, and did not meet 3 practices. Specifically, WIN-T only partially met the practices for establishing a comprehensive EVM system. The schedule contained weaknesses, including fixed completion dates—which prevented the schedule from showing the impact of delays experienced on open or successor tasks or the expected completion dates of key activities. Furthermore, WIN-T has not conducted an integrated baseline review on the current scope of work since rebaselining the prime contract in December 2007. According to program officials, this review has not been conducted because they have not yet finalized the contract. However, as of August 2009, it has been 20 months since work began, which increases the risk that the program has not been measuring progress against a reasonable baseline. Without conducting this review to validate the performance baseline, the baseline cannot be adequately updated as changes occur, and EV data cannot be used effectively for decision-making purposes.

#### EV Performance Details

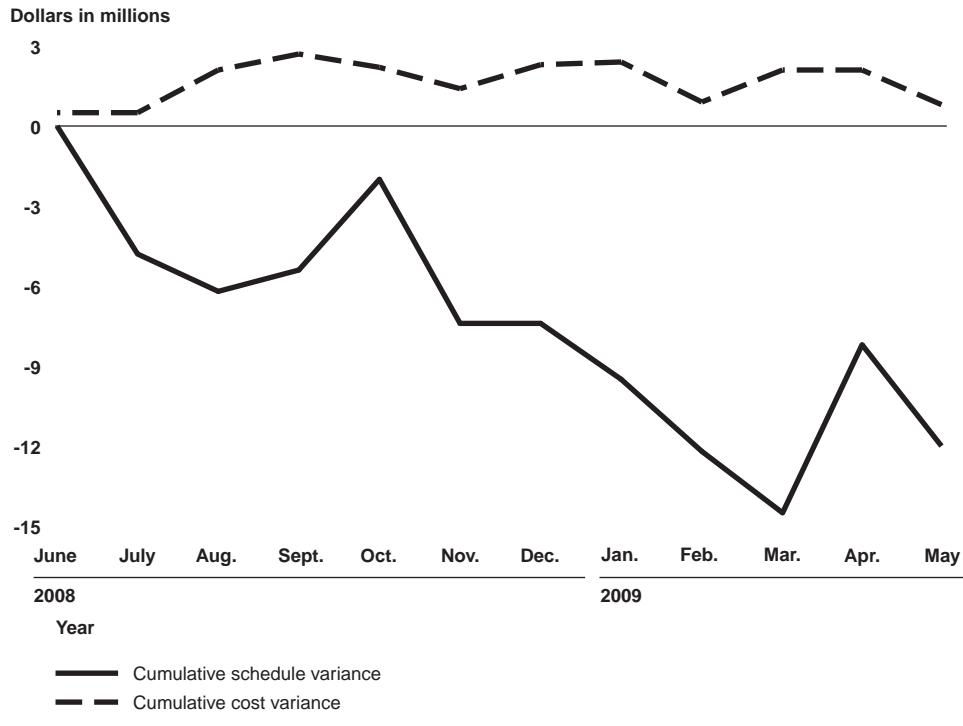
Based on contractor performance data from June 2008 to May 2009, the WIN-T contract has outperformed its planned cost targets by \$880,000. However, for the same period, it has not completed \$12.0 million in planned work. These schedule variances are due, in part, to issues found during initial testing that were addressed in subsequent software releases, resulting in planned software development work being delayed to future releases. Based on these data, we estimate that the WIN-T contract will overrun its current budget—worth approximately \$747.0 million—by \$15.1 million.

Contract percent complete: 34%

Estimates at completion:

- Contractor: \$743.3 million
- GAO: \$762.1 million

**Figure 6: GAO EV Data Analysis of Defense's WIN-T Program**



## Automated Commercial Environment

### Investment Details

Department of Homeland Security (U.S. Customs and Border Protection)

Program start date: 2001

Total life-cycle development cost:

- Current: \$2.2 billion
- Original: \$1.5 billion

Program end date:

- Current: 2016
- Original: 2016

Rebaselines: 0

Major contractor: IBM

The Automated Commercial Environment (ACE) program is the commercial trade processing system being developed by the U.S. Customs and Border Protection to facilitate trade while strengthening border security. The program is to provide trade compliance and border security staff with the right information at the right time, while minimizing administrative burden. Deployed in phases, ACE is expected to be expanded to provide cargo processing capabilities across all modes of transportation and intended to replace existing systems with a single, multimodal manifest system for land, air, rail, and sea cargo. Ultimately, ACE is expected to become the central data collection system for the federal agencies that, by law, require international trade data, and should deliver these capabilities in a secure, paper-free, Web-enabled environment. As a result of poorly managed requirements, the total life-cycle development cost of the ACE program increased from an estimated \$1.5 billion to \$2.2 billion—a \$700 million increase.



Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

**Table 14: GAO EVM Practice Assessment of Homeland Security's ACE Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

ACE fully met 9 of the 11 key practices for implementing EVM and partially met the remaining 2 practices. Specifically, ACE fully met 5 of 6 practices for establishing a comprehensive EVM system, such as defining the scope of the work effort and developing the performance baseline, but partially met the practice for scheduling the work, in part, because resources were not assigned to all activities in the master schedule. ACE fully met 2 practices for ensuring that the data resulting from the EVM system were reliable, such as adequately analyzing EV performance data, but could not fully execute the work plan because of the weaknesses found in the schedule. Lastly, ACE demonstrated that the program management team was basing decisions on EVM data.

It should be noted that the ACE program is being defined incrementally—whereby the performance baseline is continuously updated as task orders for new work are issued. As such, the use of EVM to determine the true progress made and to project reliable final costs at completion is limited.

#### EV Performance Details

Based on contractor performance data from June 2008 to May 2009, the ACE program has experienced negative cost and schedule variances. Specifically, as of May 2009, the program has exceeded its planned cost target by \$19.0 million. These variances are due, in part, to additional development and testing work needed to meet program milestones. We estimate that the program will overrun its current budget—approximately \$382.3 million—by \$24.1 million.

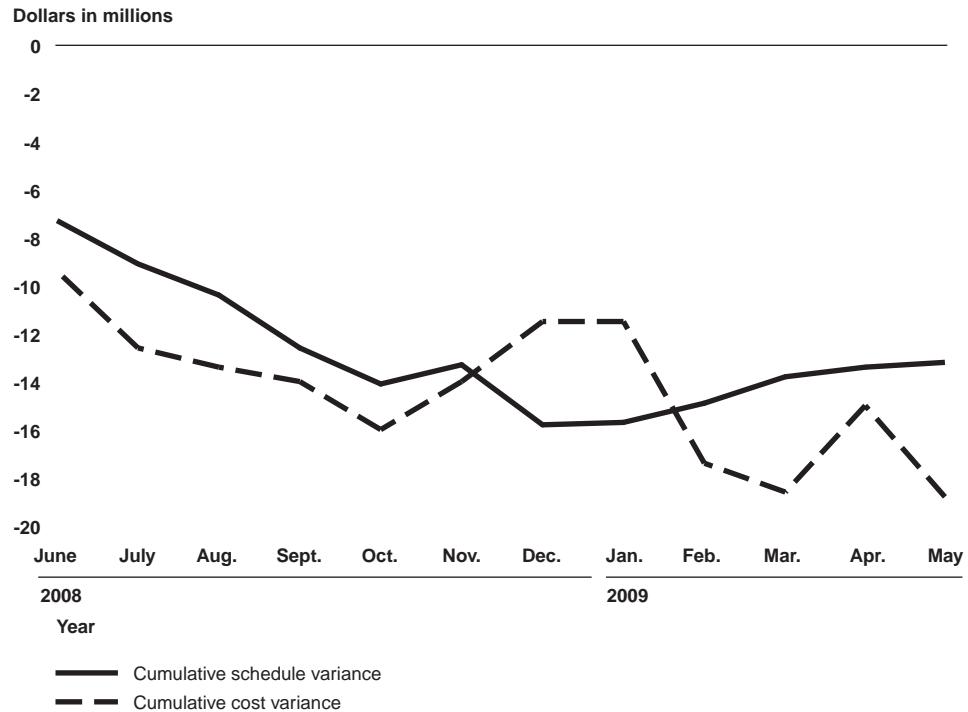
Contract percent complete: 83%

Estimates at completion:

- Contractor: \$381.8 million
- GAO: \$406.4 million

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**Figure 7: GAO EV Data Analysis of Homeland Security's ACE Program**



Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

## Integrated Deepwater System—Common Operational Picture

### Investment Details

Department of Homeland Security (U.S. Coast Guard)

Program start date: August 2002

Total life-cycle development cost:

- Current: \$1.4 billion
- Original: \$1.4 billion

Program end date:

- Current: 2014
- Original: 2014

Rebaselines: 1 (July 2007)

Major contractors: Lockheed Martin and Northrop Grumman

The Integrated Deepwater System is a 25-year, \$24 billion major acquisition program to recapitalize the U.S. Coast Guard's aging fleet of boats, airplanes, and helicopters, ensuring that all work together through a modern, capable communications system. This initiative is designed to enhance maritime domain awareness and enable the Coast Guard to meet its post-September 11 mission requirements. The program is composed of 15 major acquisition projects, including the Common Operational Picture (COP) program.

Deepwater COP is to provide relevant, real-time operational intelligence and surveillance data to human capital managers, allowing them to direct and monitor all assigned forces and first responders. This is expected to allow commanders to distribute critical information to federal, state, and local agencies quickly; reduce duplication; enable earlier alerting; and enhance maritime awareness.



Source: GAO analysis of Department of Homeland Security (U.S. Coast Guard) data.

**Table 15: GAO EVM Practice Assessment of Homeland Security's Deepwater COP Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Homeland Security (U.S. Coast Guard) data.

Deepwater COP fully met 7 of the 11 key practices and partially met 4 others. Specifically, COP fully met 5 of the 6 practices for establishing a comprehensive EVM system, such as adequately defining all major elements of the work breakdown structure and developing the performance baseline. However, the program's master schedule contained weaknesses, such as a large number of concurrent tasks and activities without resources assigned. Officials were aware of some, but not all, of the weaknesses in the schedule and had controls in place to mitigate the weakness they were aware of in order to improve the reliability of the resulting EV data. Lastly, COP was unable to fully meet 1 of the practices for using EV data for management decisions because it could not demonstrate that cost and schedule drivers impacting EV performance were linked to its risk management processes.

#### EV Performance Details

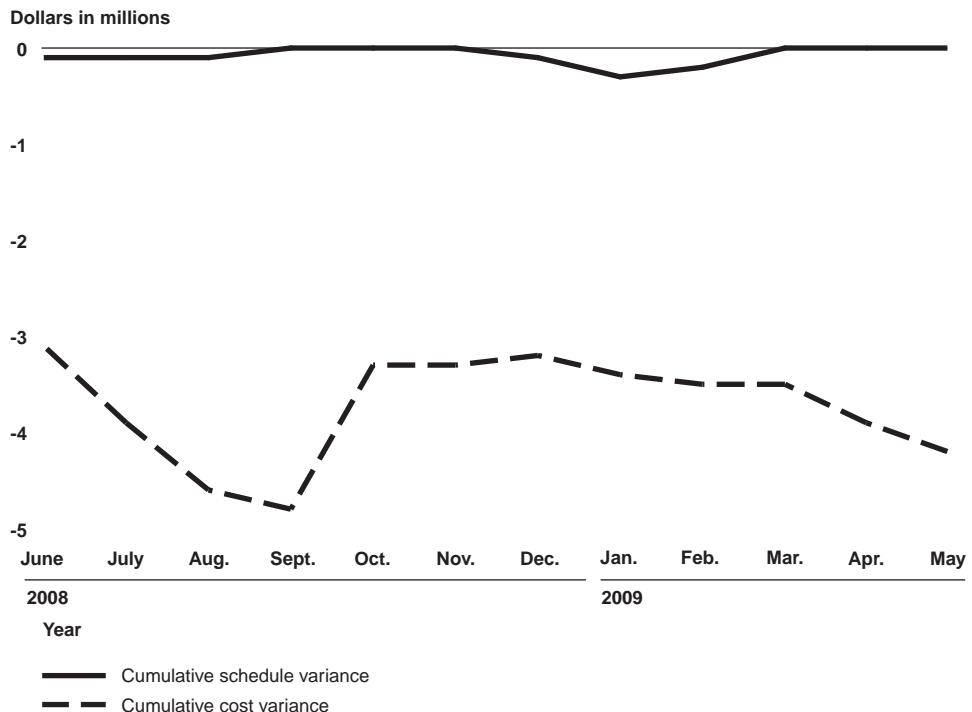
Based on performance data from June 2008 to May 2009, the Deepwater COP contractor has experienced negative cost and schedule variances. Specifically, as of May 2009, the contractor has exceeded its planned cost target by \$4.2 million. These cost variances are due, in part, to design and development tasks requiring more work than originally planned. We estimate that the contract will overrun its current budget—worth approximately \$130.2 million—by \$4.2 million. Our analysis indicates that the contract is currently on schedule.

Contract percent complete: 99%

Estimates at completion:

- Contractor: \$134.3 million
- GAO: \$134.3 million

**Figure 8: GAO EV Data Analysis of Homeland Security's Deepwater COP Program**



## Western Hemisphere Travel Initiative

### Investment Details

Department of Homeland Security (U.S. Customs and Border Protection)

Program start date: January 2007

Total life-cycle cost:

- Current: \$1.2 billion
- Original: \$1.2 billion

Program end date: June 1, 2009

Rebaselines: 1 (March 2008)

Major contractor: Unisys

The Western Hemisphere Travel Initiative (WHTI) program made modifications to vehicle processing lanes at ports of entry on the nation's northern and southern borders. WHTI is designed to allow U.S. Customs and Border Protection to effectively address new requirements imposed by the Intelligence Reform and Terrorism Prevention Act of 2004 (completing these requirements by June 1, 2009). WHTI development was completed and its implementation addressed the 39 highest volume ports of entry, which support 95 percent of land border traffic. The initiative requires travelers to present a passport or other authorized travel document that denotes identity and citizenship when entering the United States.



Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

**Table 16: GAO EVM Practice Assessment of Homeland Security's WHTI Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

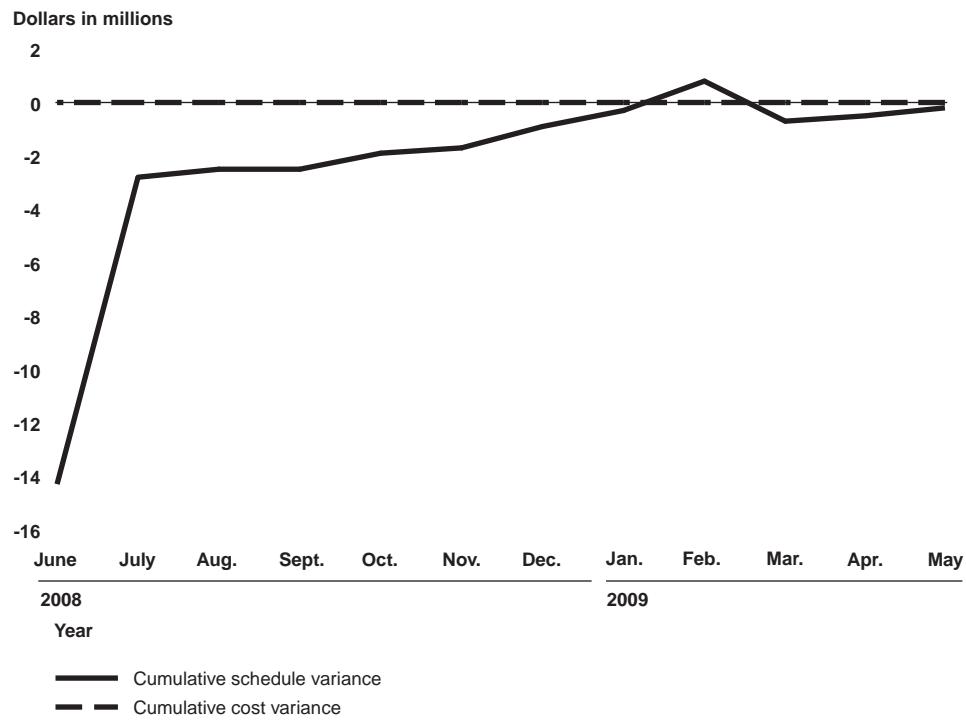
WHTI fully met 6 of the 11 key practices for implementing EVM and partially met the remaining 5 practices. Specifically, weaknesses identified in validating the performance baseline and scheduling the work limited the program's ability to establish a comprehensive EVM system. Although the program held an integrated baseline review to validate the baseline in March 2008, the review did not cover many key aspects, such as identifying corrective actions needed to mitigate program risks. Furthermore, the master schedule contained deficiencies, such as activities that were out of sequence or lacking dependencies. While program officials described their use of processes for ensuring the reliability of the EVM system's data, such as capturing significant cost and schedule drivers in the risk register, the provided documentation did not corroborate what we were told. When combined, these weaknesses preclude the program from effectively making decisions about the program based on EV data.

#### EV Performance Details

Based on performance data from June 2008 to May 2009, the WHTI contractor experienced schedule variances. However, as of June 2009, program officials stated that the WHTI contract was successfully completed on time. The contractor did not report any cost variances because it was a firm-fixed-price contract. Additionally, program officials stated that the contract was completed on budget.

Contract percent complete: 100%

**Figure 9: GAO EV Data Analysis of Homeland Security's WHTI Program**



Source: GAO analysis of Department of Homeland Security (U.S. Customs and Border Protection) data.

## Next Generation Identification

Investment Details	The Next Generation Identification (NGI) program is designed to support the Federal Bureau of Investigation's mission to reduce terrorist and criminal activities by providing timely, relevant criminal justice information to the law enforcement community. Today, the bureau operates and maintains one of the largest repositories of biometric-supported criminal history records in the world. The electronic identification and criminal history services support more than 82,000 criminal justice agencies, authorized civil agencies, and international organizations. NGI is intended to ensure that the bureau's biometric systems are able to seamlessly share data that are complete, accurate, current, and timely. To accomplish this, the current system will be replaced or upgraded with new functionalities and state-of-the-art equipment. NGI is expected to be scaleable to accommodate five times the current workload volume with no increase in support manpower and will be flexible to respond to changing requirements.		
Department of Justice (Federal Bureau of Investigation)			
Program start date: February 2008			
Total life-cycle cost:			
• Current: \$1.076 billion			
• Original: \$1.076 billion			
Program end date:			
• Current: June 2018			
• Original: April 2018			
Rebaselines: 0			
Major contractor: Lockheed Martin			



Source: GAO analysis of Department of Justice (Federal Bureau of Investigation) data.

**Table 17: GAO EVM Practice Assessment of Justice's NGI Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Justice (Federal Bureau of Investigation) data.

NGI fully implemented all 11 key EVM practices. Specifically, the program implemented all practices for establishing a comprehensive EVM system, such as defining the scope of work and scheduling the work. For example, the schedule properly captured key activities, established reasonable durations, and established a sound critical path, all of which contribute to establishing a reliable baseline that performance can be measured against. Furthermore, the NGI team ensured that the resulting EV data were appropriately verified and validated for reliability by, for example, integrating the analysis of cost and schedule variances with the program's risk register to mitigate emerging and existing risks associated with key drivers causing major variances. In addition, the program's risk register includes cost and schedule impacts for every risk and links to the management reserve process. Lastly, NGI demonstrated that it is using EV data to make decisions by performing continuous quality checks of the schedule, reviewing open risks and opportunities, and reviewing EV data in weekly management reports.

#### EV Performance Details

Based on contractor performance data from October 2008 to April 2009, NGI experienced negative cost and schedule variances. Specifically, as of April 2009, the contractor has exceeded its planned cost targets by \$1.4 million. Furthermore, as of April 2009, the contractor has not completed \$0.5 million in planned work. These variances were due, in part, to the need for additional testing resources. We estimate that the NGI contract will overrun its current budget—worth approximately \$37.5 million—by \$1.6 million.

Contract percent complete: 91%

Estimates at completion:

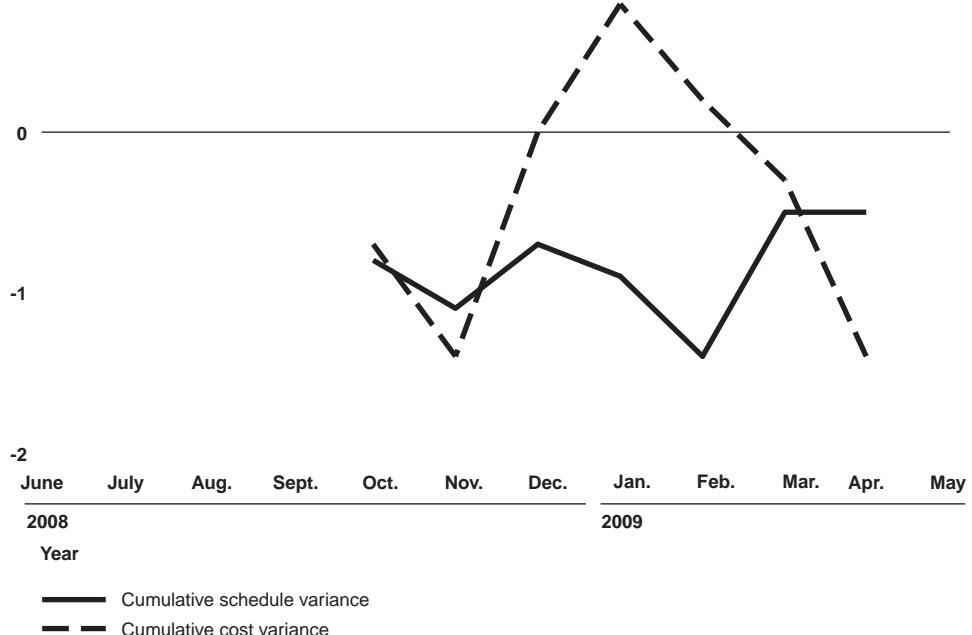
- Contractor: \$39.0 million
- GAO: \$39.1 million

Note: NGI established its EV reporting baseline in October 2008.

**Figure 10: GAO EV Data Analysis of Justice's NGI Program**

Dollars in millions

1



Source: GAO analysis of Department of Justice (Federal Bureau of Investigation) data.

## James Webb Space Telescope

### Investment Details

National Aeronautics and Space Administration

Project start date: March 1999

Total life-cycle cost:

- Current: \$4.964 billion
- Original: \$4.964 billion

Project end date:

- Current: December 2021
- Original: December 2021

Rebaselines: 0

Major contractor: Northrop Grumman

The James Webb Space Telescope (JWST) is designed to be the scientific successor to the Hubble Space Telescope and expected to be the premier observatory of the next decade. It is intended to seek to study and answer fundamental astrophysical questions, ranging from the formation and structure of the Universe to the origin of planetary systems and the origins of life. The telescope is an international collaboration of the National Aeronautics and Space Administration (NASA), the Canadian Space Agency, and the European Space Agency. JWST required the development of several new technologies, including a folding segmented primary mirror that will unfold after launch and a cryocooler for cooling midinfrared detectors to 7 degrees Kelvin.



Source: GAO analysis of National Aeronautics and Space Administration data.

**Table 18: GAO EVM Practice Assessment of NASA's JWST Project**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	○
	Identify who in the organization will perform the work	●
	Schedule the work	○
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	○
	Develop the performance measurement baseline	○
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	○
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	○
	Update the performance measurement baseline as changes occur	○

Source: GAO analysis of National Aeronautics and Space Administration data.

JWST fully met 4 of the 11 key practices and partially met 7 practices. The project only partially met practices for establishing a comprehensive EVM system because of weaknesses in the work breakdown structure, in which the prime contractor has not fully defined the scope of each work element. In addition, the project only partially met the practice for scheduling work because of weaknesses resulting from manual integration of approximately 30 schedules, although officials did explain some mitigations for this risk. We also found deficiencies in the lower-level schedules, such as missing linkages between tasks, resources not being assigned, and excessively high durations. Furthermore, JWST only partially implemented practices to ensure that the data resulting from the EVM system are reliable, due, in part, to variance analysis reports being done quarterly (instead of monthly), which limits the project's ability to analyze and respond to cost and schedule variances in a timely manner. When combined, these weaknesses preclude the program from effectively making decisions about the program based on EV data.

#### EV Performance Details

EVM for the JWST project is being performed by the prime contractor and its major subcontractors. The scope of this work includes designing and developing the telescope, the spacecraft, and the sunshield; integrating and testing the observatory; and supporting launch operations.

Based on contractor performance data from June 2008 to May 2009, the JWST project has experienced negative cost and schedule variances. Specifically, as of May 2009, the contractor has exceeded its planned cost target by \$224.7 million. A key driver in this cost overrun was greater-than-expected complexity in the work, which required additional resources. We concur with the contractor estimate that it will overrun its budget—worth approximately \$1.3 billion—by \$448.5 million. Furthermore, as of May 2009, the project has not completed \$9.4 million in planned work.

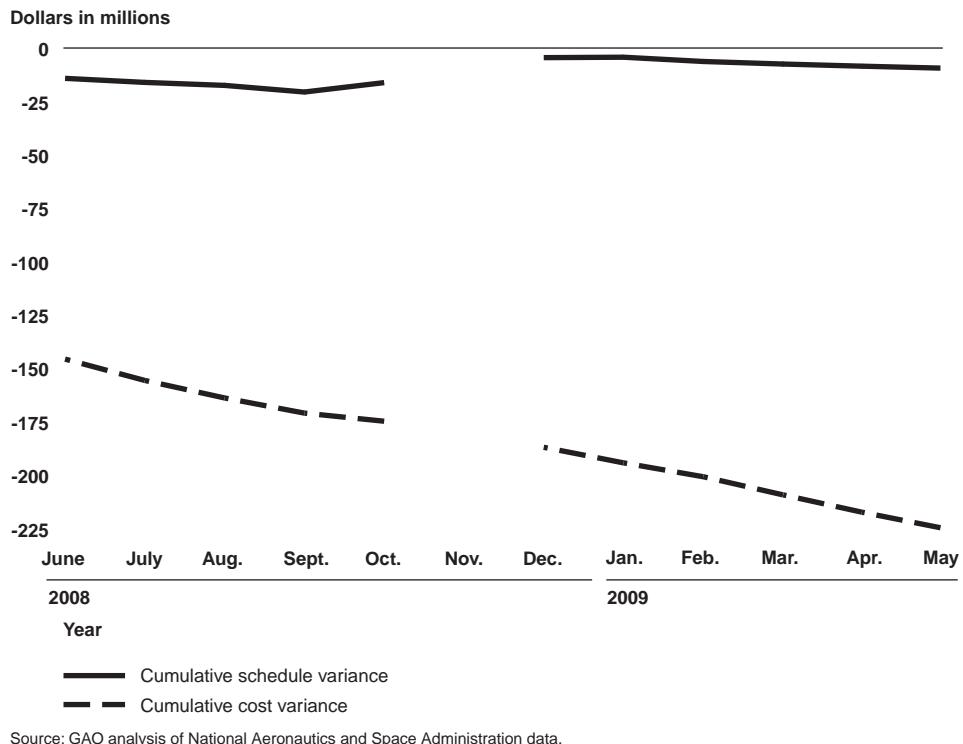
Contract percent complete: 64%

Estimates at completion:

- Contractor: \$1.7 billion
- GAO: \$1.7 billion

Note: The project suspended earned value reporting during November 2008 while undergoing a replan.

**Figure 11: GAO EV Data Analysis of NASA's JWST Project**



## Juno

Investment Details	Juno is part of the New Frontiers Program. The overarching scientific goal of the Juno mission is to improve our understanding of the origin and evolution of Jupiter. As the archetype of giant planets, Jupiter may provide knowledge that will improve our understanding of both the origin of our solar system and the planetary systems being discovered around other stars. The Juno project is expected to use a solar-powered spacecraft to make global maps of the gravity, magnetic fields, and atmospheric composition of Jupiter. The spacecraft is to make 33 orbits of Jupiter to sample the planet's full range of latitudes and longitudes.		
National Aeronautics and Space Administration			
Project start date: June 2005			
Total life-cycle cost:			
• Current: \$1.05 billion			
• Original: \$1.05 billion			
Project end date:			
• Current: October 2018			
• Original: October 2018			
Rebaselines: 0			
Major contractor: Lockheed Martin			



Source: GAO analysis of National Aeronautics and Space Administration data.

**Table 19: GAO EVM Practice Assessment of NASA's Juno Project**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	○
	Develop the performance measurement baseline	○
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of National Aeronautics and Space Administration data.

Juno fully met 8 of the 11 key practices for implementing EVM and partially met 3 practices. Specifically, the project fully met 3 practices for establishing a comprehensive EVM system, but only partially met the practices for scheduling the work, determining the objective measure of earned value, and establishing the performance baseline. Juno was unable to fully meet these practices because the project's master schedule contained issues with the sequencing of work activities and lacked a comprehensive integrated baseline review. Although an integrated baseline review was conducted for a major contract in February 2009, the program did not validate the baseline, scope of work to be performed, or key risks and mitigation plans for the Juno project as a whole, which increases the risk that the project is measuring performance against an unreasonable baseline. Juno fully implemented all 3 practices associated with data reliability and the 2 practices associated with using EV data for decision-making purposes.

#### EV Performance Details

Based on performance data from December 2008 to May 2009, the Juno project has experienced negative cost and schedule variances. Specifically, as of May 2009, the project has exceeded its cost target by \$13.2 million. Based on these data, we estimate that the Juno project will overrun its current budget—worth approximately \$369.0 million—by \$49.8 million. Furthermore, as of May 2009, the project has not completed \$12.3 million in planned work.

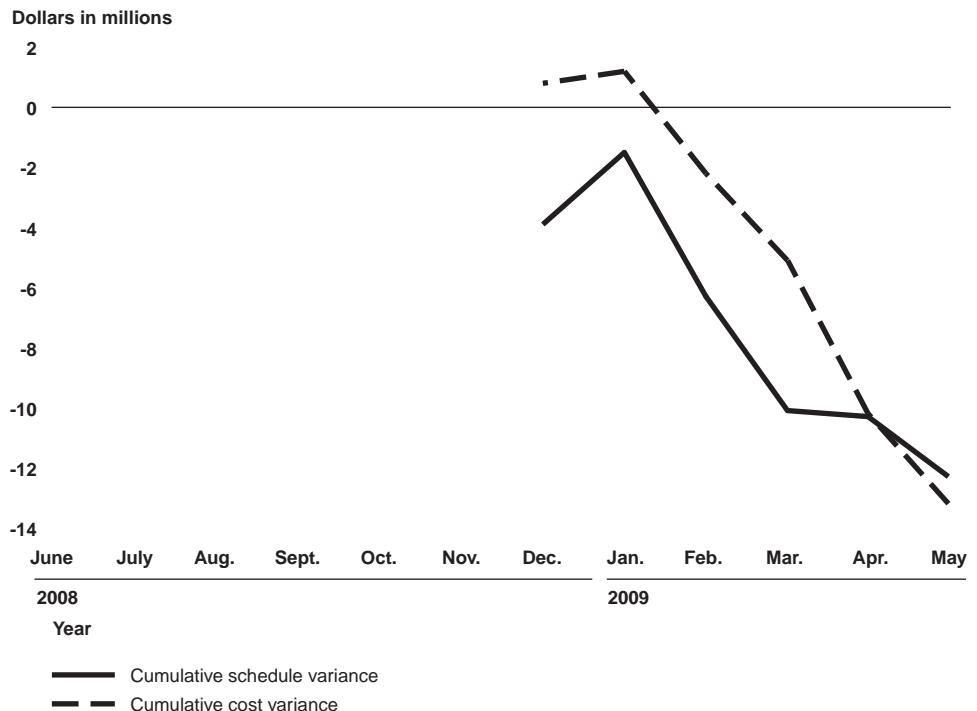
Project percent complete: 32%

Estimates at completion:

- Project: \$375.5 million
- GAO: \$418.8 million

Note: Juno established its EV reporting baseline in December 2008.

**Figure 12: GAO EV Data Analysis of NASA's Juno Project**



Source: GAO analysis of National Aeronautics and Space Administration data.

## Mars Science Laboratory

### Investment Details

National Aeronautics and Space Administration

Project start date: November 2003

Total life-cycle cost:

- Current: \$2.286 billion
- Original: \$1.634 billion

Project end date:

- Current: September 2015
- Original: September 2013

Rebaselines: 1 (March 2009)

Major contractor: None—in-house development

The Mars Science Laboratory (MSL) is part of the Mars Exploration Program. The program seeks to understand whether Mars was, is, or can be a habitable world. To answer this question, the MSL project is expected to investigate how geologic, climatic, and other processes have worked to shape Mars and its environment over time, as well as how they interact today. To accomplish this, the MSL project plans to place a mobile science laboratory on the surface of Mars to quantitatively assess a local site as a potential habitat for life, past or present. The project is considered one of NASA's flagship projects and designed to be the most advanced rover ever sent to explore the surface of Mars. Due to technical issues identified during the development of key components, the MSL launch date has recently slipped 2 years—from September 2009 to October 2011, and the project's life-cycle cost estimate has increased from about \$1.63 billion to \$2.29 billion, a \$652 million increase.



Source: GAO analysis of National Aeronautics and Space Administration data.

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**Table 20: GAO EVM Practice Assessment of NASA's MSL Project**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of National Aeronautics and Space Administration data.

MSL fully met 5 of the 11 key practices and partially met 6 others. Specifically, MSL fully met 3 practices for establishing a comprehensive EVM system, but only partially met 3 others because of weaknesses in the sequencing of all activities in the schedule and the lack of an integrated baseline review to validate the baseline and assess the achievability of the plan. While the project has taken steps to mitigate the latter weakness by requiring work agreements that document, among other things, the objective value of work and related risks for planned work packages, this is not a comprehensive review of the project's baseline. Furthermore, MSL only partially implemented practices associated with data reliability because its analysis of cost and schedule variances did not include the root causes for variances and corrective actions, which prevents the project from tracking and mitigating related risks. Lastly, without an initial validation of the performance baseline, the baseline cannot be appropriately updated to reflect program changes, thereby limiting the use of EV data for management decisions.

#### EV Performance Details

Due to significant cost and schedule overruns, the MSL project recently completed a project replan between November 2008 and February 2009. Specifically, as of October 2008, MSL had exceeded its cost targets by \$189.8 million and had not completed \$24.1 million in planned work, due primarily to technical issues experienced in the development of rover's mechanical gears and avionics components. As a result of the replan, the project's launch date was delayed 2 years, and the budget was increased from \$768.7 million to \$1.223 billion. Since the replan, the project is meeting cost targets but, as of May 2009, has not completed \$6.2 million in planned work.

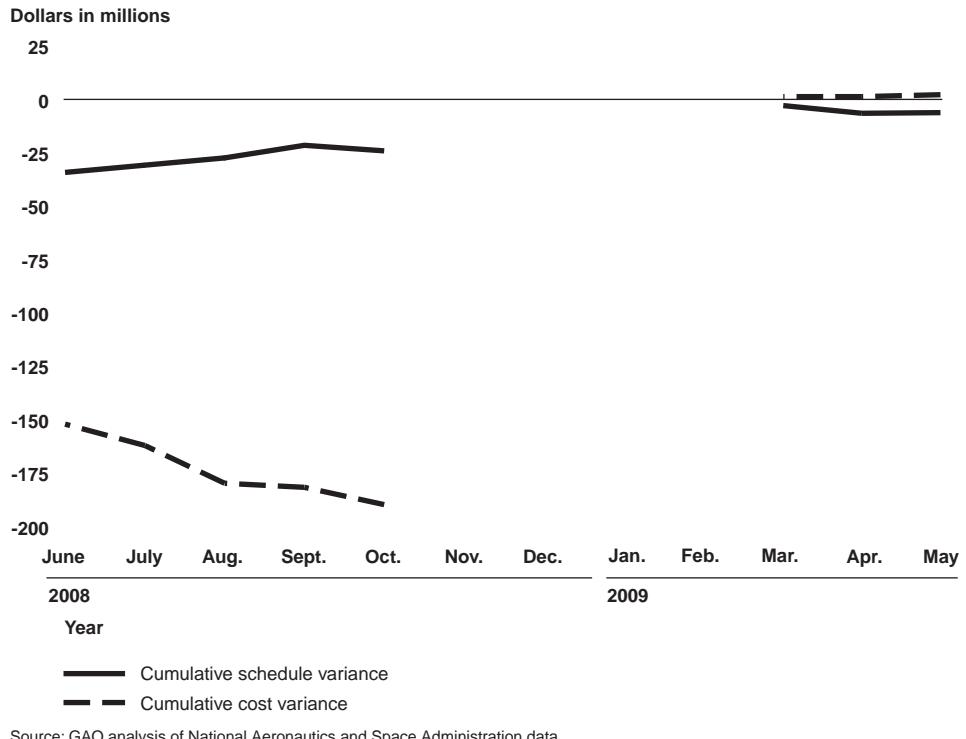
Project percent complete: 77%

Estimates at completion:

- Project: \$1.227 billion
- GAO: N/A

Note: MSL suspended EVM reporting between November 2008 and February 2009 while undergoing a project replan. Therefore, we did not have sufficient data to make a reliable independent estimate at completion. The project's EV baseline does not include components being provided by external parties, such as other NASA centers and the Department of Energy.

**Figure 13: GAO EV Data Analysis of NASA's MSL Project**



## En Route Automation Modernization

### Investment Details

Department of Transportation (Federal Aviation Administration)

Program start date: August 2002

Total life-cycle cost:

- Current: \$3.65 billion
- Original: \$3.65 billion

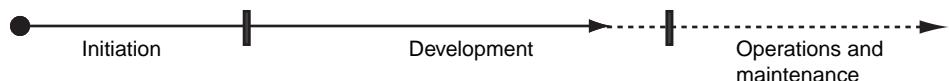
Program end date:

- Current: September 2020
- Original: September 2020

Rebaselines: 0

Major contractor: Lockheed Martin

The En Route Automation Modernization (ERAM) program is to replace existing software and hardware in the air traffic control automation computer system and its backup system, the Direct Radar Channel, and other associated interfaces, communications, and support infrastructure at en route centers across the country. This is a critical effort because ERAM is expected to upgrade hardware and software for facilities that control high-altitude air traffic. ERAM consists of two major components. One component has been fully deployed and is currently in operation at facilities across the country. The other component is scheduled for deployment through fiscal year 2011.



Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

**Table 21: GAO EVM Practice Assessment of Transportation's ERAM Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

ERAM fully met 7 of the 11 key practices and partially met 4 others. ERAM applies EVM at the contract level and incorporates EV data into its overall management of the program. However, ERAM did not perform a comprehensive review of the baseline when the contract was finalized, or take similar actions to validate the baseline and ensure that the appropriate EV metrics had been applied. While ERAM does perform limited checks of the contractor schedule, our analysis showed some issues with the sequencing of activities and the use of constraints that may undermine the reliability of the schedule as a baseline to measure performance.

However, it should be noted that the EV data are not a reflection of the total ERAM program. The government is also responsible for acquisition work—to which EVM is not being applied. Our analysis of the master schedule showed that ERAM would be unable to meet four major upcoming initial operating capability milestones due to issues associated with government work activities. Program officials noted that these milestones have since been pushed out. Since EVM is not applied at the program level, it is unclear whether these delays will impact overall cost.

#### EV Performance Details

As of April 2009, the ERAM contractor has outperformed its planned cost targets by \$36.9 million; for this same period, it has also outperformed its schedule targets by completing \$15.9 million worth of work ahead of schedule. This strong performance is attributed to significant cost savings in hardware production and unplanned efficiencies in integration and testing at ERAM deployment sites. This has offset cost overruns associated with software development, such as code growth; an unexpectedly high number of defects delivered; and the resolution of defects at lower productivity rates than planned.

Based on performance data from May 2008 to April 2009, we concur with the contractor estimate that it will underrun the current budget—worth \$1.5 billion—by \$15.0 million at completion.

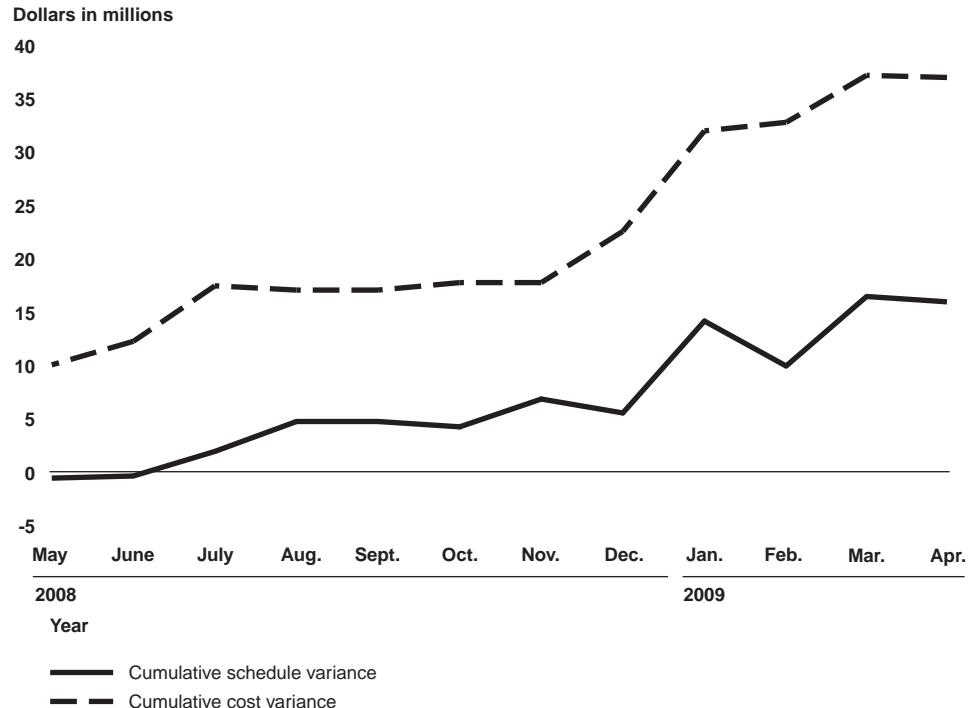
Contract percent complete: 89%

Estimates at completion:

- Contractor: \$1.465 billion
- GAO: \$1.465 billion

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**Figure 14: GAO EV Data Analysis of Transportation's ERAM Program**



Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

## Surveillance and Broadcast System

### Investment Details

Department of Transportation (Federal Aviation Administration)

Program start date: August 2007

Total life-cycle cost:

- Current: \$4.33 billion
- Original: \$4.31 billion

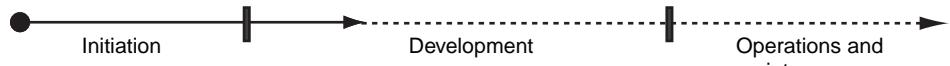
Program end date:

- Current: September 2035
- Original: September 2035

Rebaselines: 0

Major contractor: ITT Corporation

The Surveillance and Broadcast System (SBS) is to provide new surveillance solutions that employ technology using avionics and ground stations for improved accuracy and update rates and to provide shared situational awareness (including visual updates of traffic, weather, and flight notices) between pilots and air traffic control. These technologies are considered critical to achieving the Federal Aviation Administration's strategic goals of decreasing the rate of accidents and incursions, improving the efficiency of air traffic, and reducing congestion.



Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

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**Table 22: GAO EVM Practice Assessment of Transportation's SBS Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	●
	Identify who in the organization will perform the work	●
	Schedule the work	●
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	●
	Determine objective measure of earned value	●
	Develop the performance measurement baseline	●
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	●
	Analyze EVM performance data and record variances from the performance measurement baseline plan	●
	Forecast estimates at completion	●
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	●
	Update the performance measurement baseline as changes occur	●

Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

SBS fully implemented all 11 key EVM practices. Specifically, SBS has institutionalized EVM at the program level—meaning that it collects and manages performance data on the contractor and government work efforts—in order to get a comprehensive view into program status. As part of this initiative, SBS performed detailed validation reviews of the contractor and program baselines; issued various process rules on resource planning, EV metrics, and data analysis; and collected government timecard data in order to ensure consistent EV application. In addition, the program management team conducted rigorous reviews of EV performance with the SBS program manager and the program's internal management review board on a monthly basis. Our analysis of the SBS master schedule showed that it was developed in accordance with scheduling best practices. For example, the schedule was properly sequenced, and the resources were assigned. Furthermore, SBS briefed the program manager monthly on the quality of the schedule to identify, for example, tasks without predecessors.

#### EV Performance Details

As of May 2009, SBS outperformed its planned cost targets by \$14.7 million. However, for this same period, it has been unable to complete \$24.0 million worth of work. The strong cost performance is attributed to the ITT Corporation's overestimation of systems engineering resources needed to complete work and better-than-expected performance for activities associated with system safety, among other things. The negative schedule variances are due in part to delays caused by the resolution of radio hardware issues found during testing.

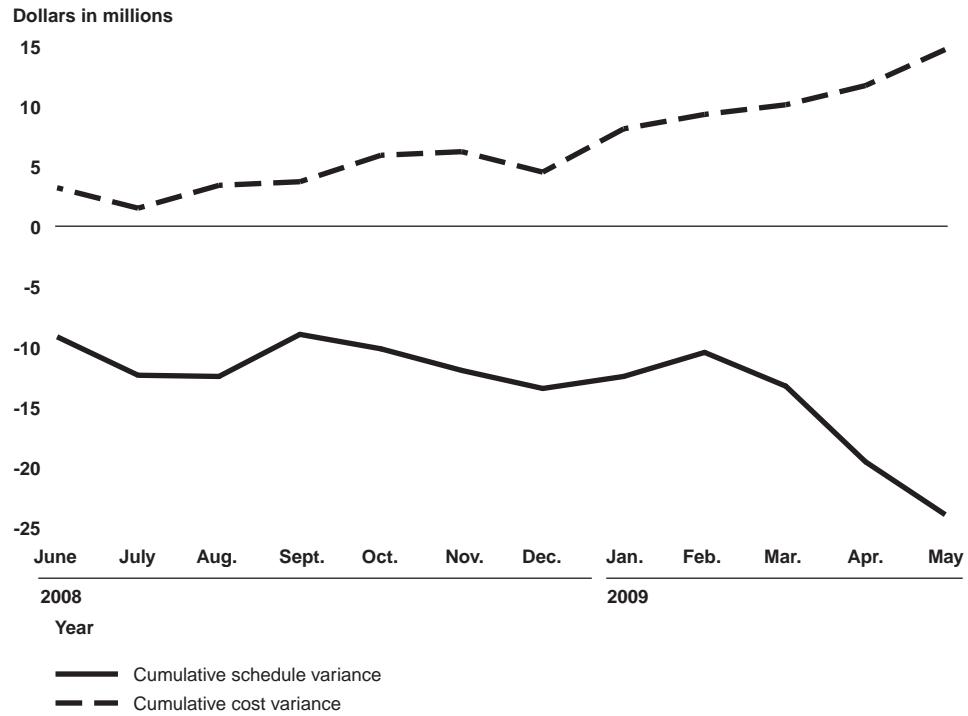
Based on performance data from June 2008 to May 2009, we estimate that SBS will most likely exceed the program's current budget—which is currently worth about \$1 billion—by about \$21 million.

Program percent complete: 27%

Estimates at completion:

- Program: \$966.3 million
- GAO: \$1.015 billion

**Figure 15: GAO EV Data Analysis of Transportation's SBS Program**



Source: GAO analysis of Department of Transportation (Federal Aviation Administration) data.

## Veterans Health Information Systems and Technology Architecture—Foundations Modernization

### Investment Details

Department of Veterans Affairs

Program start date: 2006

Total life-cycle cost:

- Current: \$1.897 billion
- Original: \$1.897 billion

Program end date:

- Current: 2016
- Original: 2016

Rebaselines: 0

Major contractor: None—in-house development

The Veterans Health Information Systems and Technology Architecture—Foundations Modernization (VistA-FM) program addresses the need to transition the Veterans Affairs electronic medical record system to a new architecture. According to the department, the current system is costly and difficult to maintain and does not integrate well with newer software packages. VistA-FM is designed to provide a new architectural framework as well as additional standardization and common services components. This is intended to eliminate redundancies in coding and support interoperability among applications. Ultimately, the new architecture will lay the foundation for a new generation of computer systems in support of caring for America's veterans. During the course of our review, the department's Chief Information Officer suspended multiple components of the VistA-FM program until a new development plan can be put in place. This action was taken as part of a new departmentwide initiative to identify troubled IT projects and improve their execution.



Source: GAO analysis of Department of Veterans Affairs data.

**Table 23: GAO EVM Practice Assessment of Veterans Affairs' VistA-FM Program**

Program management area of responsibility	Key practice	GAO assessment
Establish a comprehensive EVM system	Define the scope of effort using a work breakdown structure	<input type="radio"/>
	Identify who in the organization will perform the work	<input type="radio"/>
	Schedule the work	<input type="radio"/>
	Estimate the labor and material required to perform the work and authorize the budgets, including management reserve	<input checked="" type="radio"/>
	Determine objective measure of earned value	<input type="radio"/>
	Develop the performance measurement baseline	<input type="radio"/>
Ensure that the data resulting from the EVM system are reliable	Execute the work plan and record all costs	<input checked="" type="radio"/>
	Analyze EVM performance data and record variances from the performance measurement baseline plan	<input checked="" type="radio"/>
	Forecast estimates at completion	<input checked="" type="radio"/>
Ensure that the program management team is using earned value data for decision-making purposes	Take management action to mitigate risks	<input type="radio"/>
	Update the performance measurement baseline as changes occur	<input type="radio"/>

Source: GAO analysis of Department of Veterans Affairs data.

VistA-FM partially met 4 key practices and did not meet 7 others, despite reporting compliance with the American National Standards Institute (ANSI) standard in its 2010 business case submission. Specifically, the program is still working to establish a comprehensive EVM system to meet ANSI compliance, among other things. For example, the work breakdown structure is organized around key program milestones instead of product deliverables, and does not fully describe the scope of work to be performed. Although the program's subprojects maintain their own schedules, VistA-FM does not currently have an integrated master schedule at the program level. This is of concern because it is not possible to establish the program's critical path and the time-phased budget baseline, a key component of EVM. The reliability of the data is also a potential issue because the program's EVM reports do not offer adequate detail to provide insight into data reliability issues. Additionally, the performance baseline has not been appropriately updated; program officials stated this update is in progress, but they did not have a completion date.

#### EV Performance Details

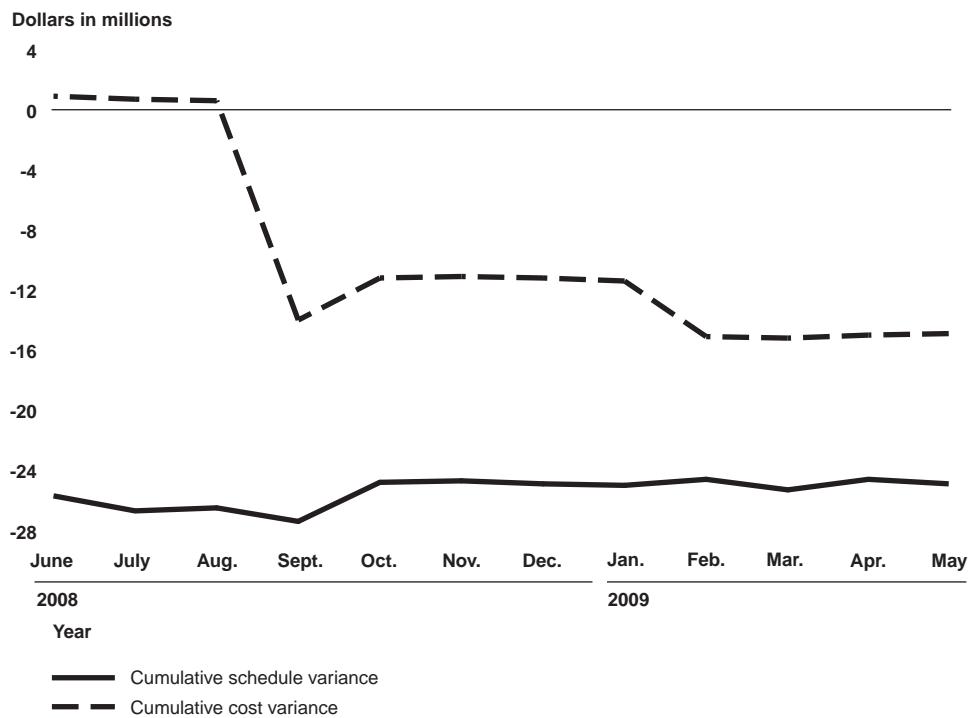
Based on performance data from June 2008 to May 2009, VistA-FM has experienced continual negative cost and schedule variances. Specifically, as of May 2009, the program has exceeded its planned cost target by \$14.9 million, and has not completed \$24.9 million in planned work. Program officials cited resource availability and interdependencies among projects as key drivers of cost and schedule variances. We estimate that the program will overrun its current budget—worth approximately \$1.897 billion—by \$350.2 million.

Program percent complete: 10%

Estimates at complete:

- Program: \$1.897 billion
- GAO: \$2.248 billion

**Figure 16: GAO EV Data Analysis of Veterans Affairs' VistA-FM Program**



Source: GAO analysis of Department of Veterans Affairs data.

# Appendix III: Comments from the Department of Commerce



**THE SECRETARY OF COMMERCE**  
Washington, D.C. 20230

September 18, 2009

Mr. David A. Powner  
Director, Information Technology Management Issues  
Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Mr. Powner:

Thank you for the opportunity to review the draft of the Government Accountability Office's (GAO) report, *Information Technology: OMB and Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions* (GAO-10-2). The report provides a comprehensive overview of the utilization of Earned Value Management (EVM) best practices and the degree to which they are implemented on major IT projects across the Federal Government.

GAO looked at sixteen major IT acquisition projects in eight different agencies. Two of the sixteen were Department of Commerce projects, both of which fall under the U.S. Census Bureau and are vital to conducting the 2010 Decennial Census: The Decennial Response Integration System (DRIS) and the Field Data Collection Automation system (FDCA). The draft report provides three recommendations for the heads of the agencies, one of which addresses the development of Department-wide EVM policies in seven key areas, and the other two address the extent to which the sixteen individual IT investment programs are complying with 11 key EVM practices. Specifically, the GAO recommends that the eight department heads:

- 1) modify agency-wide EVM policies to ensure that they address the weaknesses identified in the report (e.g., for the Department of Commerce, the failure to establish a standard Department-wide structure for defining work products);
- 2) direct key system acquisition programs to fully implement the eleven key EVM practices discussed in the report; and
- 3) take action to reverse the current negative performance trends, as shown in the earned value data, to mitigate potential cost and schedule overruns.

Regarding the second and third recommendations, I am pleased that the Census Bureau's DRIS contract was one of only three that were found to have fully implemented all eleven key EVM practices among those reviewed by GAO. Thus, these recommendations apply to the FDCA project. While I am also pleased that the FDCA program was found to have fully implemented six of the key practices—especially considering the difficulties it experienced in prior years—and to have at least partially implemented the remaining five, your audit illustrates the work that still needs to be done. As you know, the Census Bureau re-baselined the FDCA

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**Appendix III: Comments from the Department  
of Commerce**

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Mr. David A. Powner  
Page 2

program and revised the scope of this contract in October 2009. Since that time, the Commerce Investment Review Board (IRB) has been meeting quarterly with the FDCA program management team and Senior Decennial Census Staff to analyze EVM data and to track cost and schedule performance. In order to strengthen the IRB's oversight of major IT acquisitions, we have recently elevated the IRB within the Department of Commerce (Department); it will now be chaired by the Deputy Secretary of Commerce. These actions should move the FDCA program, and all of the Department's major IT acquisition projects, toward our objective of full compliance with GAO's key EVM practices.

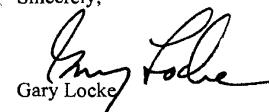
Regarding the first recommendation, the Department of Commerce understands and appreciates the value of standardized work structures. However, we maintain that the development of standardized work structures should take place at the operating unit level, given the wide diversity of missions and project complexity among the Department's operating units.

Finally, we suggest the following edits (in italics) on page 38 of the draft report to clarify that the cost changes to the DRIS contract are not due solely to the decision to revert to a paper-based Non Response Follow Up in the 2010 Decennial Census:

*"The DRIS program's estimated lifecycle costs have increased by \$372 million, most of which is due to increases in both paper and telephone workloads. The paper workload increased due to an April 2008 redesign of the 2010 Census that reverted planned automated operations to paper-based processes and requires DRIS to process an additional estimated 40 million paper forms. The telephone workload increased as a result of Decennial Census program decisions to: (1) conduct all coverage follow-up (CFU) cases by telephone, which will allow us to resolve more potential coverage errors than a combination of telephone and field follow-up; and (2) conduct CFU on more types of cases. The CFU cases derive from situations where questionnaire response data indicate potential coverage problems for a household."*

Thank you again for the opportunity to participate in this GAO study. Should you or a member of your staff have any questions, please contact Izella Dornell, Director of the Department's Program Management Office, at (202) 482-1888 or [idornell@doc.gov](mailto:idornell@doc.gov).

Sincerely,



Gary Locke

# Appendix IV: Comments from the Department of Defense



OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

SEP 15 2009

Mr. David A. Powner  
Director, Information Technology Management Issues  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Mr. Powner:

This is the Department of Defense (DoD) response to the GAO draft report GAO-10-02, "INFORMATION TECHNOLOGY: Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions," dated August 20, 2009 (GAO Code 310894). Detailed comments on the report recommendations are enclosed.

We appreciate the opportunity to comment on the draft report. Should you have any additional questions, please contact Mr. Michael Pelkey, 703-614-1253, [michael.pelkey@osd.mil](mailto:michael.pelkey@osd.mil).

Sincerely,

*Susan Heller*  
for Shay D. Assad  
Director, Defense Procurement  
and Acquisition Policy

Enclosure:  
As stated



GAO Draft Report Dated AUGUST 20, 2009  
GAO-10-02 (GAO CODE 310894)

**“INFORMATION TECHNOLOGY: AGENCIES NEED TO IMPROVE THE  
IMPLEMENTATION AND USE OF EARNED VALUE TECHNIQUES TO  
HELP MANAGE MAJOR SYSTEM ACQUISITIONS”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATIONS**

**RECOMMENDATION 1:** The GAO recommends that the Secretary of Defense modify policies governing earned value management (EVM) to ensure that they address the weaknesses that we identified, taking into consideration the criteria used in this report.

**DOD RESPONSE:** Concur. The Department agrees with the Key Components of an Effective EVM Policy identified in Table 1 of the draft report. The only weakness in the Department’s implementation of these Key Components identified by the GAO is that some agencies do not have a formal EVM training program for all personnel with program management and investment oversight responsibilities. The DoD includes EVM training modules in the training required for certification in every acquisition competency under the Defense Acquisition Workforce Improvement Act.

A Defense Support Team recently reviewed the Department’s implementation of EVM and recommended a review of Defense Acquisition University training curricula to determine the quality and applicability of EVM training in acquisition career fields. Based on the results of this analysis, enhanced EVM training modules or new courses may be implemented.

**RECOMMENDATION 2:** The GAO recommends that the Secretary of Defense direct key system acquisition programs to implement the EVM practices that address the detailed weaknesses that we identified in Appendix II, taking into consideration the criteria used in this report.

**DOD RESPONSE:** Concur. The Department agrees with the Key EVM Practices for System Acquisition Programs identified in Table 3 of the draft report. The DoD Federal Acquisition Regulations Supplement and DoD Instruction 5000.02 establish requirements for use of EVM in all acquisition programs with cost- or incentive-type contracts over \$20 million. EVM data is required and routinely used at all levels of acquisition program management and oversight. These requirements, and related oversight procedures, are implemented via procedures, processes and guidance documents at both the Departmental and Component levels.

As the Department's Acquisition Executive, the USD(AT&L) requires that all levels of program management and oversight routinely use EVM data. At program reviews and milestone decisions, both the status of the contractor's EVM system and EVM metrics describing program status are considered. The Defense Contract Management Agency is the preeminent authority on validation of contractor EVM systems and contractor compliance with their approved systems. The Department will direct that Program Managers of the Air and Space Operations Center – Weapon System (AOC-WS), Joint Tactical Radio System – Handheld, Manpack, and Small Form Fit (JTRS HMS), and Warfighter Information Network – Tactical (WIN-T) programs, at their next program review or milestone, describe the actions taken to address the weaknesses identified by the GAO.

**RECOMMENDATION 3:** The GAO recommends that the Secretary of Defense direct key system acquisition programs to take action to reverse current negative performance trends, as shown in the earned value data, to mitigate the potential cost and schedule overruns.

**DOD RESPONSE:** Concur. The Department concurs that it is essential to maintain appropriate oversight of acquisition programs, including the use of EVM data to understand program status and anticipate potential problems. The Department has a comprehensive acquisition program management oversight process that mandates the use of EVM data for these purposes, as detailed in DoD Directive 5000.01 and DoD Instruction 5000.02. Program Managers provide monthly reports on cost, schedule, and technical performance trends, and the planned steps to mitigate known problems and risks. The Department will issue direction to Program Managers to take action to reverse negative cost or schedule trends identified in EVM data.

# Appendix V: Comments from the Department of Justice



U.S. Department of Justice

SEP 10 2009

*Washington, D.C. 20530*

Mr. David A. Powner  
Director, Information Technology Management Issues  
United States Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Powner:

The Department of Justice has reviewed the Government Accountability Office's (GAO) draft report "Information Technology: OMB and Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions (GAO-10-2). The GAO made three recommendations in its draft report. After discussion with your office, it was agreed that recommendation number two was inadvertently directed to the Department and we did not need to respond. Consequently, we are responding to recommendation numbers one and three only.

**GAO RECOMMENDATION # 1: Modify policies governing EVM to ensure that they address weaknesses that we identified, taking into consideration the criteria used in this report.**

**DOJ RESPONSE:** The DOJ concurs with this recommendation. The Department received full credit in five out of the seven EVM policy assessment areas. The two areas in which the Department received partial credit due to weaknesses identified by GAO were in the areas of: 1) training requirements and 2) use of standard structures for defining the work products.

In the area of training requirements, GAO recommended that our EVM policy require training for all personnel with investment oversight and program management responsibilities. In response, the Department has modified the DOJ Information Resources Management Policy Order 2880.1B on EVM training. The policy order now requires that the DOJ Chief Information Officer enforce EVM training for all personnel with investment oversight and program management responsibilities. The DOJ EVM Implementation Guide, which implements the policy order further describes the guidance on this requirement to include all executive personnel with oversight responsibilities that need to understand EVM concepts to make sound investment decisions and all program personnel who work with or would like to be more proficient in EVM.

David A. Powner

2

In the area of standard structures for defining work products, GAO stated the Department has yet to standardize its product structures. The Department recently implemented a new requirement and currently, the DOJ EVM Implementation Guide requires that the DOJ components use a standard, product-oriented Work Breakdown Structure (WBS) for their major developmental IT efforts. The Department will require the use of a standard, product-oriented WBS in future statements of work for major IT developmental efforts.

**GAO RECOMMENDATION # 3:** Direct key system acquisition programs to take action to reverse current negative performance trends, as shown in the earned value data, to mitigate potential cost and schedule overruns.

**DOJ RESPONSE:** The DOJ concurs with this recommendation. The GAO reviewed the FBI's Next Generation Identification (NGI) program. The GAO estimated that the NGI major development contract will overrun its current budget by an estimated \$1.6M. The NGI program office is committed to remaining within its overall program budget. To provide additional focus on cost, a formal risk has been opened to monitor and address EVM thresholds. The NGI program office has established an Executive Change Control Board to prevent scope increases. If any changes were proposed that would affect scope within NGI, they would be subject to review and approval by the oversight board which is chaired by the FBI Deputy Director. The major development contractor has established a Tiger Team to identify root causes for past variances; reviewed the work remaining; and applied corrective actions including implementing "system administrator day-in-the-life" testing. In addition, the major development contractor is utilizing a rolling wave planning approach, in which the contractor establishes periods of performance at the lowest-level tasking as the next consecutive segment of work is detailed. Effort taking place outside the planning window is identified in Planning Packages. As the planning window (90-day minimum) opens, the effort is then planned in detail into Work Packages. Finally, an Independent Verification and Validation vendor has been established that independently reports on a monthly basis to the Executive Assistant Director for Science and Technology on the status of the program.

The Department appreciates this opportunity to comment on the draft report prepared by the GAO.

Should you have any questions regarding this topic, please do not hesitate to contact Richard Theis, DOJ Audit Liaison on 202-514-0469.

Sincerely,



Lee J. Lofthus  
Assistant Attorney General  
for Administration

# Appendix VI: Comments from the National Aeronautics and Space Administration

National Aeronautics and  
Space Administration  
**Office of the Administrator**  
Washington, DC 20546-0001



September 18, 2009

Mr. David A. Powner  
Director  
Information Technology Management Issues  
United States Government Accountability Office  
Washington, DC 20548

Dear Mr. Powner:

NASA appreciates the opportunity to comment on your draft report entitled, "Information Technology: Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions," (GAO-10-02).

While we acknowledge that opportunities exist for improvement regarding the implementation of Earned Value Management (EVM), the NASA projects included in the scope of the audit integrate and rely on various elements of Information Technology (IT), but are not IT-specific projects. Governance of the NASA projects identified in the draft report is derived from NASA space flight guidance rather than NASA information technology guidance.

In the draft report, GAO makes three recommendations intended to address weaknesses identified in federal agencies' (including NASA's) policies and practices using EVM. Specifically, GAO recommends the following:

**Recommendation 1:** Modify policies governing EVM to ensure that they address the weaknesses that we identified, taking into consideration the criteria used in this report.

**Response:** Partially concur. NASA is revising NASA Procedural Requirements (NPR) for programs and projects to include expanded and strengthened policies governing EVM application and processes. Specifically, policy revisions address the following areas raised by your review:

- 1) **Standard structure for defining IT work products:** The three NASA projects included in the scope of the GAO audit were space flight projects governed by space flight project management policy. GAO did not audit any of NASA's IT projects which are governed by IT project management policy. As cited in the GAO report, NASA's IT project management policy does not currently require a standardized work break down structure for IT projects. It should be noted that the amount of FY 2010 spending (per the FY 2010 budget request) on IT projects is approximately \$978M, or 5 percent of NASA's budget. Of that, only \$170M is development, modernization and enhancement (DME), or 1 percent of NASA's budget. There are currently no DME IT

investments governed by IT project management policy that meet the EVM requirement of \$20M. However, NASA recognizes the importance of a standardized WBS for future IT DME projects and is developing a standard WBS for those activities. Estimated completion date for approval of the IT project management policy interim directive is October 2010.

- 2) **EVM Training Requirements:** NASA agrees with the GAO that training is an essential input to the proper application of EVM throughout the Agency. NASA also believes that ongoing enhancements to training courses and programs build continuous improvement into NASA's EVM. However, it has been NASA's view that mandating EVM training without having the context in which it can be immediately applied is not as effective as voluntary, timely, and relevant EVM training in terms of the student's ability to both retain and apply learning. NASA's Academy of Program, Project and Engineering Leadership (APPEL) EVM and Schedule Management training courses are updated with relevant policy, methodology, lessons learned, and analytical knowledge to benefit our program and project teams at all levels. These APPEL courses are augmented by NASA's online and self-paced on-line EVM training offerings and tool-based and role-based training courses in place at NASA field centers. Additionally, over the past year, APPEL has increased the number of project-dedicated, tailored training engagements to focus on the unique challenges of specific projects.

Over the past two years, NASA has offered 19 EVM classes and has trained 409 participants. Of those offerings, one was project specific and 15 were provided onsite at Centers, providing an opportunity for multiple project team members to attend and discuss EVM as it applies to their respective projects. Project-based EVM training has been very successful and has the potential to increase EVM effectiveness by taking the subject and lessons learned directly to the project practitioners "just-in-time." Training that is provided "just-in-time" and tailored to current project issues is immediately applicable on-the-job, effective, and dynamic. This is in addition to the many program and project management personnel who have been trained in EVM prior to 2007 and who have applied it on projects during their career.

- 3) **Rebaselining Criteria:** NASA recognizes the need to enhance the re-baselining policy. The policy governing EVM and baseline revision is contained in space flight project management policy. An interim directive including some revisions to the re-baselining policy will be issued in September 2009. The policy will continue to be refined taking into account the GAO recommendations as part of a formal revision which is due by October 2010. IT project management policy will be updated following the space flight project management policy to reflect applicable changes to the baseline policy.

**Recommendation 2:** Direct key system acquisition programs to implement the EVM practices that address the detailed weaknesses that we identified in Appendix II, taking into consideration the criteria used in this report.

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**Response:** Concur. NASA acknowledges the identified weaknesses and will work toward closing the gaps. NASA acknowledges that EVM is a valuable performance assessment tool and utilizes it as such. NASA also employs a number of other performance assessment tools and a comprehensive governance and review process at the project, program, Mission Directorate, Center and Agency levels to assess project performance and reduce mission risk. NASA believes that mission success is not dependent on the use of a single tool or method, but rather is a complex proactive integrated management, governance, and review process that leverages a variety of tools to provide in-sight into project performance which allows the agency to mitigate risk and take corrective action when necessary.

**Recommendation 3:** Direct key system acquisition programs to take action to reverse current negative performance trends, as shown in the earned value data, to mitigate the potential cost and schedule overruns.

**Response:** Concur. The three NASA projects reviewed by GAO are high risk, high complexity projects. Each of these projects is reviewed on a monthly basis by the Program, Science Mission Directorate, managing NASA Center and ultimately at the Agency level. This hierarchical review process ensures awareness of project performance at all levels within the Agency enabling leadership engagement, proactive and timely risk mitigation, and corrective actions. This review hierarchy provides comprehensive, integrated, and objective information that describes the “performance-to-plan” of the Agency’s programs, projects, and institutional capabilities. These reviews are action oriented and ensure open, cross-functional communication among NASA’s organizations to enhance Agency performance. As part of this monthly review structure, NASA will continue to address any negative performance trends, as shown in the earned value data, and continue to develop mitigation plans to minimize cost and schedule overruns for each project. NASA holds flexibility above the level at which earned value is reported on contracts to manage variances.

We will continue to work to mitigate the EVM weaknesses identified by the GAO as they pertain to NASA. If you have any questions or require additional information, please contact Sandra Smalley at 202-358-4731.

Thank you again for the opportunity to review this draft report, and we are looking forward to your final report to Congress.

Sincerely,



Lori B. Garver  
Deputy Administrator

# Appendix VII: Comments from the Department of Veterans Affairs



THE SECRETARY OF VETERANS AFFAIRS  
WASHINGTON

September 21, 2009

Mr. David A. Powner  
Director, Information Technology  
Management Issues  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Powner:

The Department of Veterans Affairs (VA) has reviewed the Government Accountability Office's (GAO) draft report, *INFORMATION TECHNOLOGY: Agencies Need to Improve the Implementation and Use of Earned Value Techniques to Help Manage Major System Acquisitions* (GAO-10-2) and generally agrees with GAO's conclusions and concurs with GAO's recommendations.

VA agrees with GAO's specific findings related to the VA VistA FM Program. GAO's assessment of the key Earned Value Management (EVM) practices is fair and accurately reflects the state of the program. While GAO was conducting this Governmentwide review of EVM, VA was conducting reviews of the state of all of its Office of Information and Technology (OIT) projects and reached similar findings. As a result, 9 of the original 26 projects placed under the Program Management Accountability System (PMAS) are from the VistA FM Program. These projects are now being managed and monitored under PMAS. OIT is currently refining the processes related to PMAS; these processes do include the key practices of EVM as outlined in the draft report. VA will include how it plans to implement the EVM techniques under PMAS in its comments to the final report 60 days after it is issued by GAO.

VA appreciates the opportunity to comment on your draft report.

Sincerely,

A handwritten signature in black ink, appearing to read "Eric K. Shinseki".

Eric K. Shinseki

Enclosure

Department of Veterans Affairs (VA) Comments to  
Government Accountability Office (GAO) Draft Report  
**INFORMATION TECHNOLOGY: Agencies Need to Improve the Implementation  
and Use of Earned Value Techniques to Help Manage Major System Acquisitions**  
(GAO-10-2)

**Technical comments:**

**Page 9: Background, 1<sup>st</sup> paragraph:**

Recommendation: The project information on the OMB IT Dashboard should be independently validated by required external audits to the project before posting status on schedule, cost and evaluation. Currently, OMB relies on self-regulation on the part of program and project management. The fact that the sole-reported VA Vista-FM project had "partially met 4 key [EVM] practices, and did not meet 7 others, *despite reporting compliance with the ANSI standard in its 2010 business case submission*" is an example of what can occur when no effective oversight or review is in place.

**Page 16 to page 17, Criteria for implementing EVM on all IT major investments:**

This section notes, VA "only partially met this key practice because its policy did not clearly state whether programs or major sub-components of programs (projects and sub-projects) had to comply with EVM".

General Comment: This section aptly highlights the need for visibility at the project level vs. the program level. Major investment progress reported at the program level does not show adequate detail for OMB at the project level for portfolio type E-300 investments. Overall, the program could be doing well, but individual projects could have problems that might be missed.

**Page 22, 1<sup>st</sup> full paragraph:**

This section notes on performance baselines, "Weaknesses in these schedules included improper sequencing of activities, such as incomplete or missing linkages between tasks,....on future work activities".

**Recommendation(s):**

- 1) There should be completeness in Work Breakdown Structure (WBS) dictionaries which elaborate on the nature and substance of key scheduled activities.
- 2) This section should emphasize the inclusion of independent verification and validation (IV&V) and other review activities and the allocation of "realistic" project resources and scheduled time frames for those activities.

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# Appendix VIII: GAO Contact and Staff Acknowledgments

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## GAO Contact

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David A. Powner, (202) 512-9286 or [pownerd@gao.gov](mailto:pownerd@gao.gov)

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## Staff Acknowledgments

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In addition to the contact name above, individuals making contributions to this report included Carol Cha (Assistant Director), Neil Doherty, Kaelin Kuhn, Jason Lee, Lee McCracken, Colleen Phillips, Karen Richey, Teresa Smith, Matthew Snyder, Jonathan Ticehurst, Kevin Walsh, and China Williams.

# Related GAO Products

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*Defense Acquisitions: Assessments of Selected Weapon Programs.*

[GAO-09-326SP](#). Washington, D.C.: March 30, 2009.

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Washington, D.C.: March 2, 2009.

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